



# TRAINING MANUAL FOR LANDFILL OPERATORS & MANAGERS

**2011 Edition**

Kentucky Department of Environmental Protection

**Division of Compliance Assistance**

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# Certification and Licensing Program

## **Mission**

Promote responsible environmental stewardship.

## **Goal**

Provide drinking water, wastewater and solid waste operators with the basic knowledge required to effectively treat water and make it safe to drink.

The Division of Compliance Assistance offers free compliance assistance. Our services are available to all individuals, communities and businesses regulated by the Kentucky Department for Environmental Protection. We want to help you succeed!

Hotline and Website for regulatory, technical or operational concerns  
800-926-8111  
[dca.ky.gov](http://dca.ky.gov)

Other programs administered by the Division of Compliance Assistance:

Kentucky Excel Program  
Kentucky Brownfield Program  
Kentucky Environmental Compliance Assistance Program

## **Disclaimer**

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## **CHAPTER 1**

# **WASTE MANAGEMENT IN KENTUCKY**

### Chapter 1 Behavioral Objective

1. Explain the history and importance of waste management in Kentucky.
2. List which branches in waste management handle the activities related to solid waste.
3. Comprehend Kentucky's regulations and statutes dealing with the process of waste disposal.
4. Understand and be able to apply the Kentucky regulations relating to the certification requirements for solid waste facilities.



## **CHAPTER 1**

### **Waste Management in Kentucky**

This section discusses the history of waste management in Kentucky, and current regulations and statutes dealing with the process of waste disposal.

#### **Division of Waste Management**

The largest division of the Department for Environmental Protection with 276 staff positions, the Division of Waste Management consists of seven branches: Solid Waste Branch, Recycling and Local Assistance Branch, Hazardous Waste Branch, Field Operations Branch, Underground Storage Tank Branch (USTB), Superfund Branch and Program Planning and Administration Branch. The whole agency subscribes to the mission:

***“Protect and enhance Kentucky’s environment to  
improve the quality of life for all Kentuckians.”***

To accomplish this mission, the department has developed a set of objectives to be implemented by each division.

The objectives are to:

- Reduce and/or maintain elimination of division permit and data entry backlogs.
- Protect human health and enhance Kentucky’s land resources.
- Place emphasis on the reclamation and recycling of waste that is generated.
- Design requirements to assure that the remaining waste is disposed of properly.
- Restore lands that are impacted from releases when wastes are *not* managed properly.

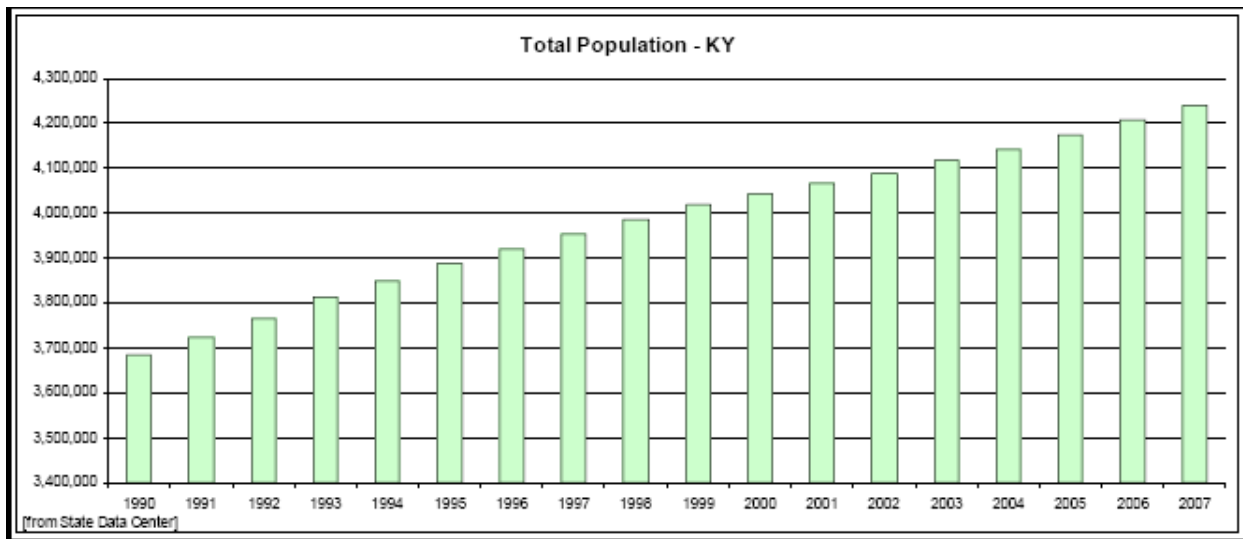
#### **Solid Waste Branch**

The Solid Waste Branch is responsible for the review and issuance or denial of permits for solid waste and special waste landfills, landfarming and composting facilities and registrations for permit-by-rule facilities.

The mission of the Solid Waste Branch is to assure proper solid and special waste management practices through the implementation of comprehensive permitting, monitoring and training.

## **Waste Generation and Characteristics**

All counties in Kentucky offer a system of universal waste collection. Universal waste collection means that collection service is made available to households, either through curbside collection or through drop-off centers/collection centers/transfer stations for use by households. The total population in Kentucky is increasing, which will lead to the amount of waste generated in the state increasing. The charts below show these trends of increasing population as well as increasing amounts of waste being generated.



In 2007, Kentucky experienced a 3 percent decrease in Kentucky waste disposal in Kentucky landfills and a 25 percent increase in the amount of out-of-state waste disposed in Kentucky landfills, based on information provided by the county solid waste coordinators. This increase is attributed to the lower disposal cost and lower tipping fees compared to surrounding states. Kentucky exported 6 percent of its waste to out-of-state landfills, an increase from 4 percent in 2006. Kentucky's total waste generation rate for 2007 increased by 5 percent while the total population increased by less than 1 percent.

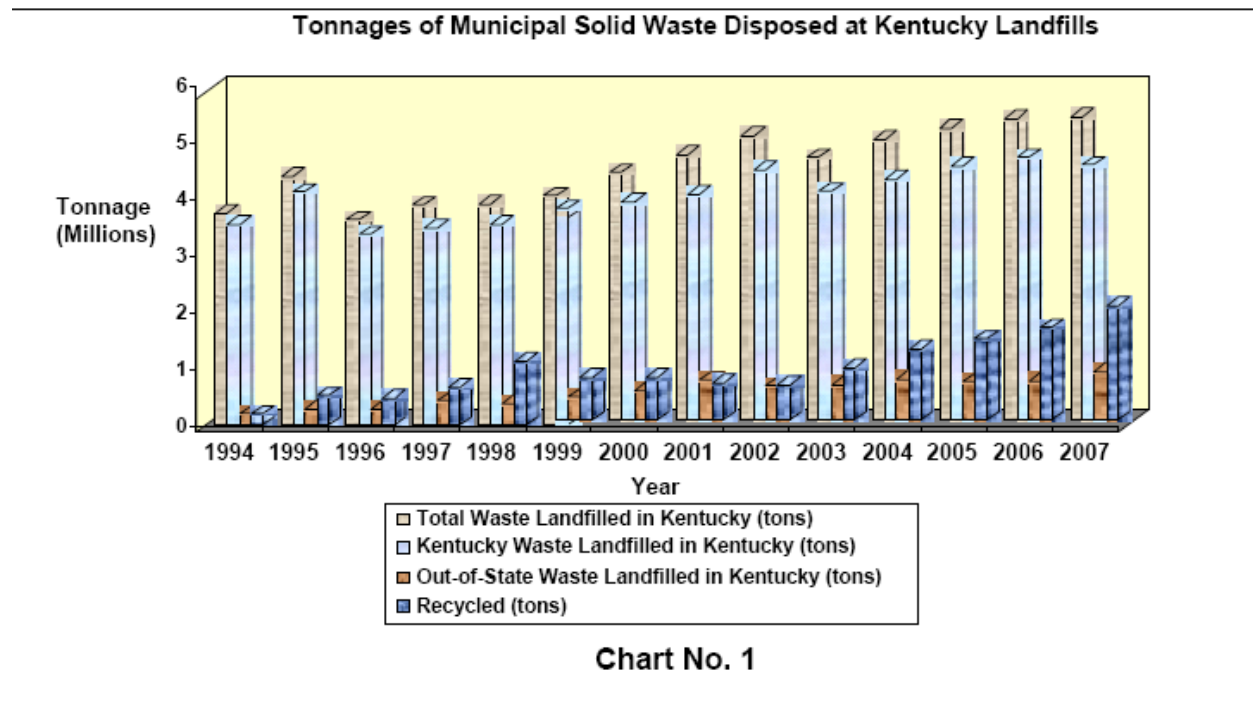
The average cost for waste disposed at Kentucky landfills in 2007 was \$29.62 per ton. Chart No. 1 illustrates the comparison of tonnages of in-state, out-of-state and the combined total of municipal solid waste received at landfills and the amount in tons of recycled materials in Kentucky, beginning with the base year 1994.

## **Municipal Solid Waste Collection Programs**

Each Kentucky county has established a universal waste collection program. Universal waste collection is available to households through curbside collection (door-to-door) or self-hauls to a convenience center, transfer station, or contained landfill. Since 2003, participation in door-to-door collection service has increased 7 percent. Since the division began gathering data in 1993, participation in door-to-door collection service has increased 44 percent. Chart No. 2 shows the number of households participating in collection system from 2003 to 2007.



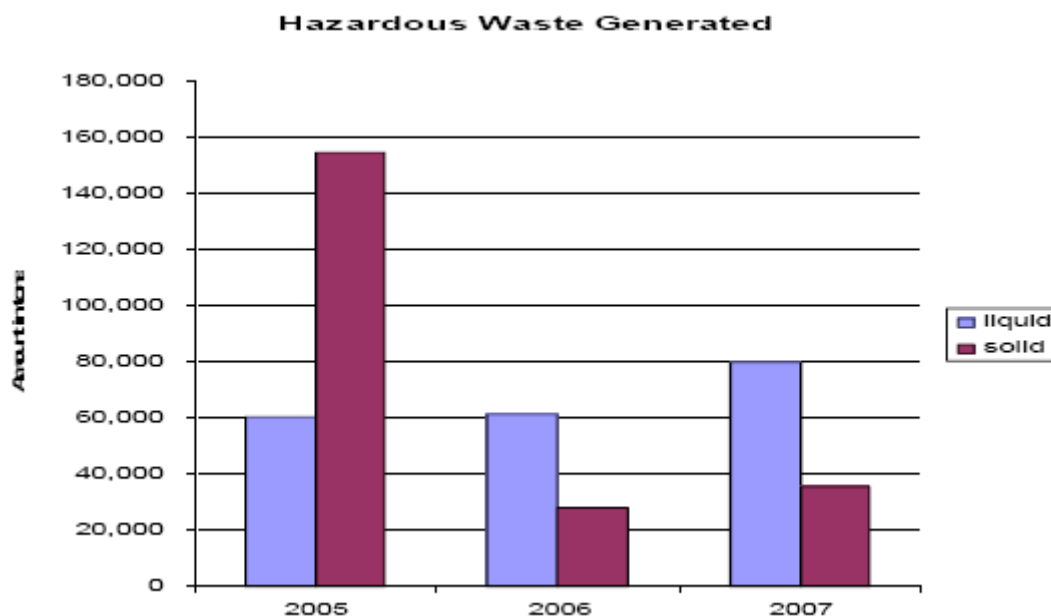
The average participation rate for collection systems in 2007 is 87.05 percent, which means approximately 13 percent of households (219,115 households) are disposing of their garbage illegally or are not accounted for by current tracking methods. Self-haul to a transfer station or convenience center is a legal method of disposal. However, most counties have difficulty tracking customers to these type facilities.



This chart shows a decreasing trend in both the number of pending permit applications, and the number of permits being issued beyond regulatory timeframes. The more rapid reduction in backlogged items in the early part of the backlog elimination effort was due to the branch addressing easier applications first, coupled with the elimination of applications backlogged for administrative reasons.

### **Hazardous Waste Branch**

The Hazardous Waste Branch oversees the management of hazardous waste “from cradle to grave”. This involves the promotion of hazardous waste minimization, hazardous waste management and remediation of hazardous waste releases. These activities are accomplished through permitting, corrective action, registration and reporting requirements.



### **Field Operations Branch**

The mission of the Field Operations Branch (FOB) is to identify and abate imminent threats to human health and the environment through fair and equitable inspections, technical assistance and education.

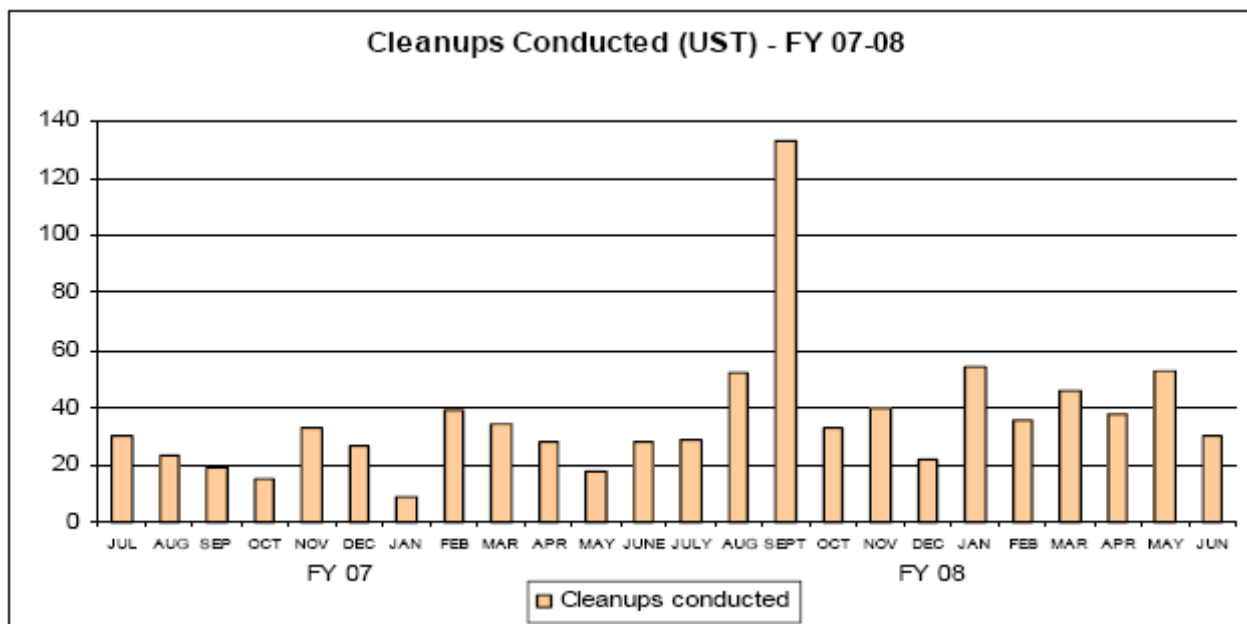
The branch performs inspections at sites managing solid waste, hazardous waste, underground storage tanks and PCBs. The primary duty of a regional inspector is to check the compliance of waste facilities.

The branch includes a central office and 10 waste management regional offices located throughout Kentucky. Staff from these offices are familiar with the local waste management issues and can respond to questions and concerns.

### **Underground Storage Tank Branch**

The mission of the Underground Storage Tank Branch is to provide for prevention, abatement and control of contaminants from regulated underground storage tanks (USTs) that may threaten human health, safety and the environment.

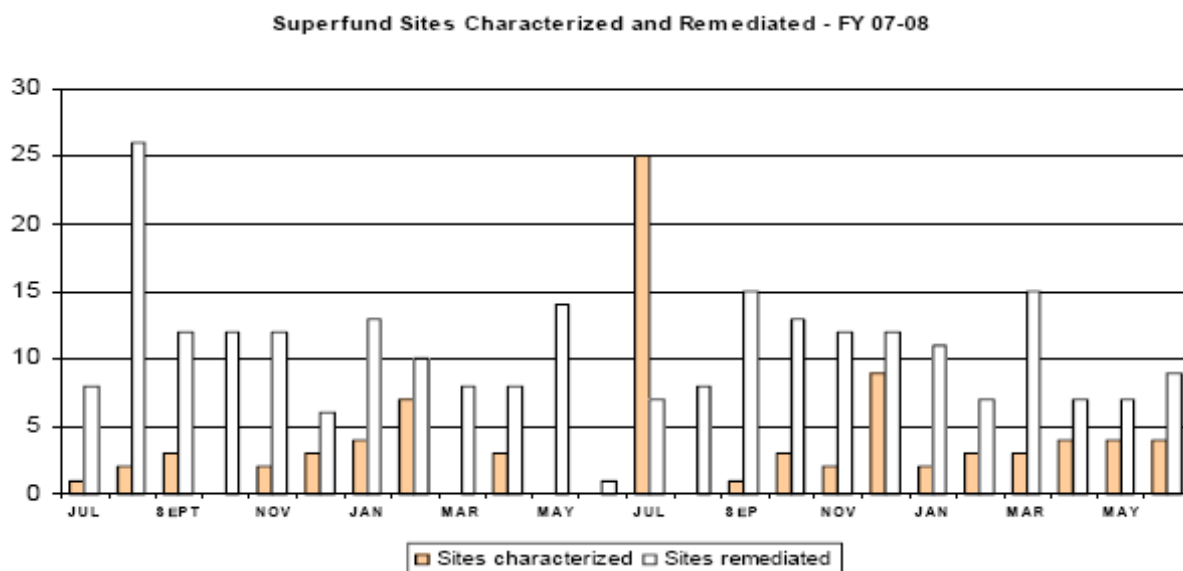
The Underground Storage Tank Branch (USTB) regulates the registration, compliance, closure, inspections and corrective actions of the UST systems.



### **Superfund Branch**

The Superfund program seeks to ensure that contaminated sites are evaluated and cleaned up in a timely manner to reduce risks to human health and the environment. In most cases, this means overseeing companies or individuals who have taken responsibility for cleaning up contamination found on their property. In cases where a responsible party cannot be found is unable to act, the Superfund Branch may take a direct role in cleaning up a site.

The chart below shows the number of sites that the Superfund branch has characterized and remediated.



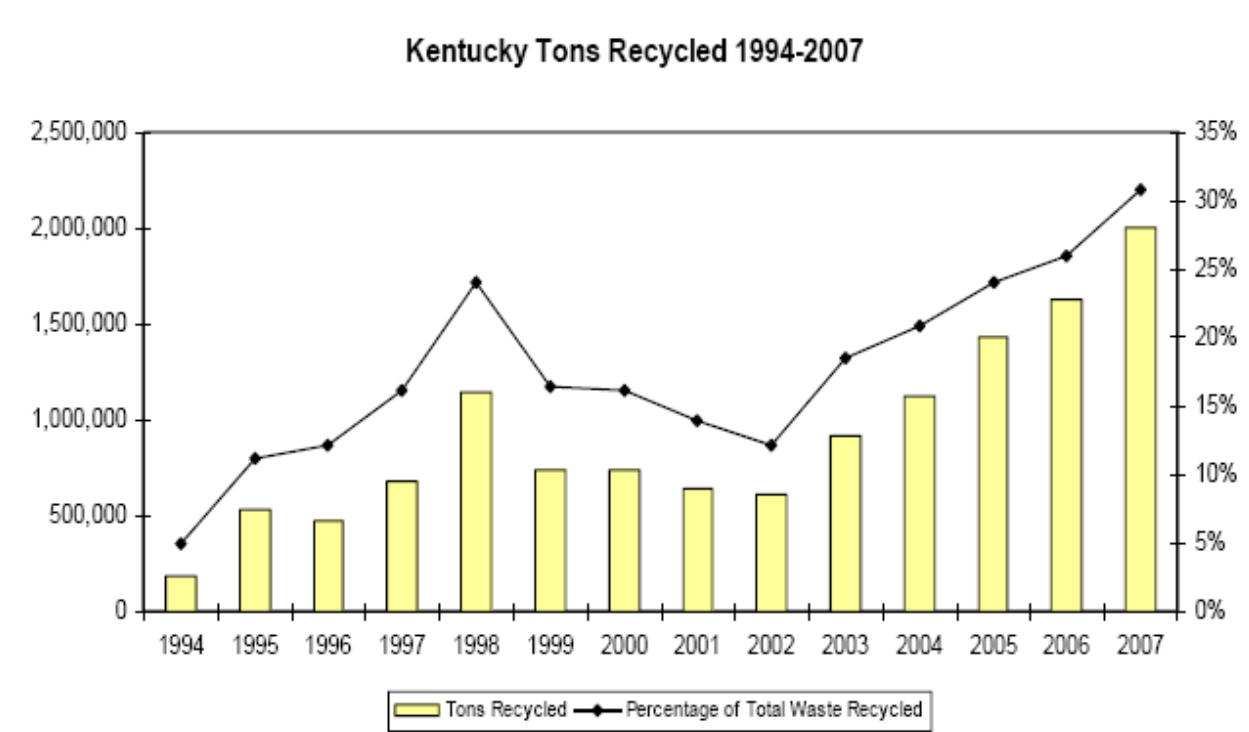
## **Program Planning and Administration Branch**

The mission of the Program Planning and Administration Branch (PPA) is to promote sound waste management programs by providing administrative and operational support to all branches in the division through efficient and effective financial administration, personnel management and regulatory development.

## **Recycling and Local Assistance Branch**

The Recycling and Local Assistance Branch (RLA) provides continuous technical assistance and training to the public and private entities on solid waste issues and regulatory requirements and promotes individual responsibility and accountability for proper solid waste management.

Kentucky's recycling rate on common household items (aluminum, cardboard, steel, plastic, newspaper, glass and paper) increased from 27 percent in 2006 to 31 percent in 2007. As new recycling programs establish themselves, Kentucky's recycling rates should increase and set an example for other states.

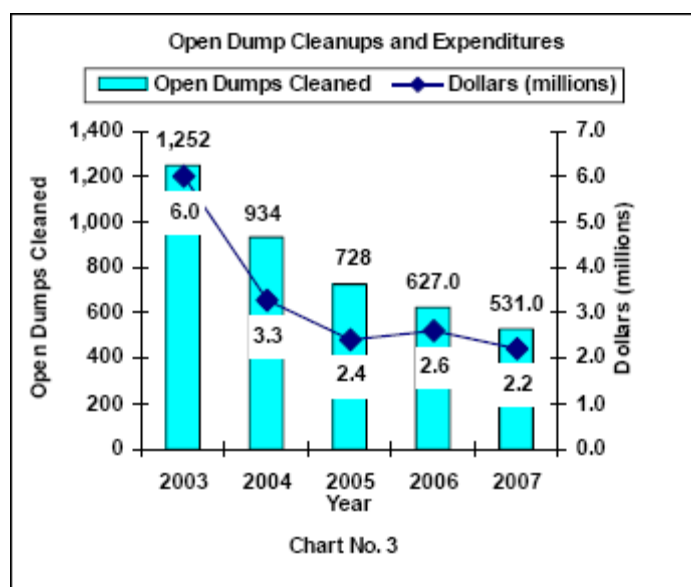


## Need for Proper Management

Before waste management was regulated in Kentucky, most towns or cities had a common location where garbage, and a vast array of other materials, was disposed. These “old town dumps” were the de facto landfill for the area, and they were rarely operated in a manner consistent with better and current standards. Also, in most cases they were not properly capped to prevent migration of contaminated leachate and other pollutants. Hundreds of these sites are scattered across the state (there are approximately 620 sites according to the division’s records).

The Historic Landfill program was established as a section within the Solid Waste Branch in 2003 to address proper closure and remediation of these “old town dumps.” Closure/remediation work is presently on-going at several sites across the state. Funding for the program is through a one-time bond issuance of \$25 million, plus an annual amount of \$2.5 million collected from the Environmental Remediation Fee receipts (KRS 224.43-505). The \$25 million bond has since been expended and the program is operating using the \$2.5 million annually provided for in the statute.

Since 1993, more than 24,000 illegal open dumpsites have been cleaned at a cost of \$60.1 million. The chart illustrates the number of dumpsites cleaned, per year, since 2003, using varying sources of funding, both public and private. In 2007, counties cleaned 531 illegal open dumps at a cost of \$2.2 million. The average cost to clean each dumpsite was \$4, 143. There were 721 known dumpsites remaining in 2007, 479 of which were identified during the 2007 calendar year.



Open dumps are breeding grounds for disease vectors such as rats, flies, fleas, mosquitoes, and birds which carry and transmit pathogens creating potential health hazards. Twenty-two (22) human diseases have been traced to improper solid waste management.

In addition to the direct health impacts of open dumps, communities may face impacts from:

- lowered community's self esteem and property values,
- contaminated drinking water supplies,
- safety hazards (accident rate for sanitary workers is 4 1/2 times greater than the next most hazardous industry - coal mining),
- odors and methane gas from decaying vegetation and garbage,
- land removed from other productive uses (wildlife habitat, residential, etc.),
- increase threat of forest fires (open dumps are a major cause),
- direct costs to property owners and public agencies for cleanup (During the 1998-1999 fiscal year the state highway department collected more than 96,000 bags of roadside litter, which took a total of 215,670 man hours at a cost of \$3,961,000 for roadside litter cleanup alone), and
- reduction of a stream's carrying capacity resulting in increased flood heights during storms.

Waste generated by our communities must be stored, collected, and disposed of properly to protect public health and the environment. Good management practices will also minimize the economic and social costs associated with indiscriminate dumping. HB 174 will provide Kentucky counties with the opportunity to receive funding for cleanup of illegal dumps.

### **Summary of HB 174**

#### **HB 174, as passed:**

- Establishes priorities for proper solid waste management in Kentucky through waste reduction, recycling, proper closure of abandoned landfills, education, proper collection and disposal of solid waste, elimination of illegal open dumps and abatement of litter.
- Identifies counties as being in best position to plan for solid waste collection, with technical and financial assistance from the state.
- Creates revenue to begin to address some of the priority issues: abandoned landfills, illegal dumps and litter.
- Revenue will be generated through; \$25 million bond sale, \$1.75 environmental fee assessed on each ton of waste disposed in municipal solid waste disposal facilities and \$5 million annual transfer from highway road and contingency funds.
- Kentucky Pride Fund established to receive funds, which will be administered by the Energy and Environmental Cabinet.
- \$1.75 environmental fee on waste disposed at municipal solid waste disposal facilities to be collected at transfer stations or contained landfills in the Commonwealth.

- Cabinet to develop regulations with a formula for estimating tons of waste at transfer stations without scales. Notice of Intent published July 1, 2002, with NOI public hearing on July 30, 2002. Draft regulation filed November 1, 2002 for 30-day public comment period.
- Revenue generated from all sources expected to be approximately \$32.5 million in first year (FY 03), and \$14.8 million in ongoing revenue for the following years.
- The \$25 million dollar bond and \$5 million from the environmental fee to be used by the Cabinet for the identification and closure of abandoned landfills, as well paying debt service on the bond.  
Bond can only be issued upon approval of state budget.
- Interest on Pride Fund, up to \$1 million, will fund Kentucky Environmental Education Master Plan.
- The remaining environmental fee revenues and road fund monies (expected to be \$9.8 million annually) are to be used by the counties and cities for the cleanup of illegal dumps and litter.
- Counties and cities will receive litter monies based on their population and road miles.
- Counties must clean roadsides three (3) times a year, and cities must clean city streets two (2) times a year.
- Cabinet will prioritize illegal dumps based on health and environmental risk in first year.
- Cabinet will reimburse counties for illegal dump cleanup, with county providing 25% match.
- Counties must have approved solid waste management plan to receive reimbursement.
- Requires counties to have a solid waste coordinator with enforcement powers.
- Gives solid waste coordinators additional authority to issue citations for illegal dumping and littering.
- Requires waste haulers and recyclers to register and report to counties in which they operate.
- Suspends until July, 2006, Cabinet enforcement actions against counties and cities regarding abandoned landfill closure.
- Cabinet must present a plan to legislature by December '04 for closure of remaining abandoned landfills, with recommendations for funding.

## **Kentucky Regulations**

The regulations found in 401 KAR Chapters 30, 47, 48, and 49, address solid waste planning requirements, design, and operational standards applicable to all solid waste sites or facilities.

The general requirements for all landfill types are:

- 401 KAR 47:100 General Provisions for Obtaining a Solid Waste Permit
- 401 KAR 47:120 Conditions Applicable to all Solid Waste Permits
- 401 KAR 47:130 Changes to Solid Waste Permits; Expiration of Solid Waste Permits
- 401 KAR 47:160 Application Procedures
- 401 KAR 47:170 Notice of Intent to Apply for a Solid Waste Permit
- 401 KAR 47:180 Contents of the Administrative Application for Solid Waste Landfills
- 401 KAR 47:190 Contents of the Technical Application for Solid Waste Landfills
- 401 KAR 48:050 Siting Requirements for Solid Waste Landfills
- 401 KAR 48:300 Surface and Groundwater Monitoring and Corrective Action
- 401 KAR 48:310 Financial Requirements and Bonds

## **Kentucky Statutes**

Landfill permitting laws are found in Kentucky Revised Statutes (KRS) Chapter 224. These statutes override any regulation in Kentucky.

The KRS subchapters related to Solid Waste are:

- KRS 224.001 Generalities
- KRS 224. 010 Environmental and Public Protection Cabinet
- KRS 224. 016 State—Federal Relations
- KRS 224.040 Waste Generalities
- KRS 224. 043 Solid Waste
- KRS 224.046 Hazardous Waste
- KRS 224. 050 Other Specific Types of Waste



## **Environmental Performance Standards**

The Environmental Performance Standards (401 KAR 47:030) outline the minimum requirements to assure disposal sites or facilities do not pose an unreasonable risk or adverse effect on human health or the environment. The rule is similar to 40CFR257, which was promulgated by the U.S. EPA. All solid waste management facilities in Kentucky must demonstrate compliance with these standards. Sites failing to meet these standards are considered open dumps, which are prohibited by law. The Environmental Performance Standards (EPS) are categorized by site selection, landfill operation, and safety.

## **Public Education**

There is a great need for public education regarding solid waste issues. However, public education usually suffers the first cuts during tight budget periods and is most often written into the planning process as an afterthought or luxury item. Public education activities are essential to effective solid waste management. Therefore, this issue has become an integral part of the training and technical assistance rendered by the Cabinet.

The Cabinet is involved in many activities that foster public education. Public education involves the distribution of information and delivery of presentations along with other one-way communication to the public. These activities include technical assistance, networking with other state agencies, production of bulletins and newsletters, clean community programs, and special presentations.

## **Operator/Manager Certification Program**

*Note – certification of Landfill Operators and Managers is now administered by the Division of Compliance Assistance, Certification and Licensing Branch.*

Each construction/demolition/debris landfill and contained landfill must have at least one certified landfill operator and one certified landfill manager or one individual certified for both categories. The Division may require a certified operator and/or manager at permit-by-rule, registered permit-by-rule, or residual landfill facilities as a permit condition. This requirement will be based on the characteristics of the waste stream, the site, and the experience and qualifications of the operator and/or manager.

The certified landfill operator must be physically at the facility during working hours. However, in the event the certified landfill operator cannot be at the site, the certified landfill manager or an interim operator, physically located on site, can be designated responsible for daily site operations. This provision is intended to ensure that only qualified personnel supervise landfill operations.

## **Interim Operator**

An interim operator must be appointed whenever a certified landfill operator or manager has to be absent for an extended period. An "extended absence" means:

- more than 10 consecutive operating days for landfill operators
- more than 30 consecutive operating days for landfill managers
- more than 5 consecutive operating days for land application operators.

The permit holder must select the interim operator and notify the Division of Compliance Assistance, Certification and Licensing Branch, in writing, 10 days prior to an anticipated absence and immediately upon discovery of an extended absence due to an emergency or unanticipated circumstance. The following information must be included in the notice:

- name and qualifications of intended replacement operator (must complete an application for operator certification (DEP 6031) to obtain this information), and
- length of replacement period.

The Division of Compliance Assistance, Certification and Licensing Branch will:

- evaluate the qualifications, and
- notify the permit holder and intended interim operator, in writing, of approval or denial.

## **Certification Applications**

The individual seeking certification must file an application with the Division of Compliance Assistance, Certification and Licensing Branch. The Division will review applications and supporting documents to determine the eligibility of the applicant. No one can be eligible for certification unless they complete the appropriate training class provided by the Division.

## **Applicant Qualifications**

Applicants will be evaluated on education and experience as it relates to the appropriate category of landfill.

A landfill **operator** must have:

- completed high school, either by graduation or by obtaining an equivalency certificate, and
- one year experience.

A landfill **manager** must have:

- completed high school, either by graduation or by obtaining an equivalency certificate, and
- a minimum of two years administrative experience in a related field **or**
- a minimum of two years of postsecondary education; **or**
- a minimum of two years of a combination of experience in a related field and postsecondary education.

If neither condition is met, the Division will consider the number of years experience in a related field in determining eligibility for examination on a year for year basis.

### **Classes and Exams**

The Division of Compliance Assistance will provide at least one scheduled training session each year. Certification will be granted at the end of the session if the applicant achieves a score of at least 70 percent on the examination. If an individual fails the examination, the candidate for certification will be given the opportunity to re-take the examination once more without any additional charge. If the class participant fails the examination the second time, they will be required to wait until the next scheduled session to repeat the training class and examination.

### **Certificate Issuance**

Upon successful completion of the training session, the Division of Compliance Assistance will issue both a full and wallet size certificate indicating the category of certification acquired. All landfill operators and managers are required to be recertified every 5 years.

If the certified operator terminates employment at a landfill, the certificate will remain valid until expiration or revocation. Certificates must be carried during working hours or displayed onsite. An individual who is not certified and assumes the responsibility of operator or manager must meet interim operator requirements and attend the next scheduled training session.

### **Terms of Certification**

With the exception of special waste landfills, every landfill in the state is required to have and be operated by a certified landfill operator and manager. A certificate may be revoked when the Division determines:

- the certificate was obtained by fraud, deception, or submission of inaccurate data,
- the certificate holder failed to perform required duties, including failure to comply with permit conditions, or

- the certificate holder failed to use reasonable care and judgment in performance of required duties.

Maintaining a certified operator and manager at a landfill is considered a condition of the landfill operating permit. The permit may be revoked and/or penalties sought for violation of this requirement.

## **CHAPTER 2**

### **LANDFILL CATEGORIES**

#### Chapter 2 Behavioral Objectives

1. List the types of landfills that require permits.
2. Identify the waste streams or conditions of the permits for solid waste facilities.
3. Understand the phases of the permit process.
4. Explain a Local Determination and why it is important.
5. Outline the phases to construct or modify a landfill.
6. Explain what must be done before a permit will be issued.
7. Identify the types of financial guarantees to ensure proper closure and closure care.



## CHAPTER 2

# LANDFILL CATEGORIES

The following section is an overview of the types of landfills and their permits offered by the Solid Waste Branch. These types of permits are specific to the waste streams or conditions of the permit.

### Landfill Categories

The first step in deciding on building a landfill is to consider what kind of landfill you want to construct. The following section outlines the solid waste permit types, which are classified, based on the waste managed and facility type.

Because of differences in waste types and disposal methods, solid waste disposal landfills are divided into 4 categories:

1. **Contained landfills** are facilities designed and permitted for the disposal of solid wastes including:
  - non-hazardous solid waste (residential, commercial, institutional, industrial and municipal waste),
  - shredded tires,
  - whole OTR (off-the-road) tires,
  - household hazardous waste,
  - limited quantity generator hazardous waste, and
  - non-hazardous spill clean-up residues.

A Contained Landfill will cost in the neighborhood of \$750,000 to \$1.2 million for the application process. This includes design engineer's cost and the permitting fees. The construction of the liner system and the cap will cost an additional \$150,000 to \$250,000 per acre to construct. This does not include the operating cost. Most contained landfill owners charge \$25-30 per ton to recoup costs and to make a profit.

2. **Construction/Demolition Debris (CDD)** landfills are facilities designed and permitted to accept waste from:
  - Non-hazardous construction and demolition debris

CDD landfills will cost approximately \$500,000 to \$1 million for the application process, which include the design engineer's cost and application filing fees. To construct a CDD landfill liner system and the cap will cost approximately \$75,000 per acre. Most CDD landfill owners charge \$15-20 a ton.

3. **Residual landfills** are facilities designed and permitted for the disposal of specific solid waste(s) or residue(s), which can be fully characterized (i.e., has a limited number of hazardous constituents that a lab may identify and quantify). Special wastes, defined as low in hazard, high in volume, may also be disposed of in a residual landfill.

Examples of residual wastes include:

- industrial process waste,
- utility wastes (i.e., fly ash and flue ash),
- cement kiln dust, and
- wastes from air and water pollution control devices.

Residual landfill designs are based on the type of waste to be put in the landfill. The liner and cap system can be as little as clear the ground of vegetation, put the waste in and cover it up with dirt to a double composite liner system. The cost of this type of landfill has a wide range, based on the type of waste placed in it. The permit application fee for all three phases of the application process is \$5,500, with the consultant fees ranging from \$250,000 to \$750,000. Residual landfill owners charge \$10-15 per ton.

4. **Special Waste landfills** are facilities designed and permitted for the disposal of usually utility waste. Examples of utility waste include:
- Fly ash
  - Bottom ash
  - Scrubber sludge

Special waste applications consist of only one phase, but the requirements for construction of this type of landfill are similar to residual landfill requirements. The fee to process the permit application is \$5,000. Consultant fees range from \$250,000 to \$500,000. Special waste landfill owners often charge disposal fees ranging from \$5 to \$15 per ton.

### **Other Landfill Categories**

There are several categories of landfills recognized by the Cabinet that may fall under the broader four categories. These include residential and inert, land application, composting, Permit-by-Rule, Registered Permit-by-Rule, Beneficial Reuse, Emergency, and Research, Development, and Demonstration permit categories.

**Residential and inert landfills** are no longer recognized as landfill permit categories. Residential landfills had the option of converting to a contained or C/D/D landfill, provided relevant operating standards were met, or closed in accordance with 401 KAR 47:080, Section 5(1) before July 1, 1992. Inert landfills either converted to a C/D/D or residual landfill, provided relevant operating standards were met, or closed in accordance with 401 KAR 47:080, Section 5(3).



**Land application** is a category of permit, which allows solid waste and special waste to be surface applied or injected into the upper layer of soil to improve soil quality or provide plant nutrients.

**Composting** is a method of solid waste and special waste management whereby organic wastes are decomposed, in a controlled setting to produce a material that can be applied to supplement the soil.

Solid and special wastes suitable for land application or composting include:

Solid waste:

- food processing wastes and,
- yard waste.

Special waste:

- wastewater plant biosolids, and
- water plant sludge

**Permit-by-Rule** category of permit is for certain classes of solid waste disposal sites or facilities are presumed to hold a permit without the owner submitting an application to the Cabinet. Because all waste disposal facilities must be permitted, the rule grants the authority to operate.

Examples of a Permit-by-Rule permit are:

- sawdust piles,
- asphalt residue,
- waste piles,
- Less than 100 tires, shredded tires occupying less than ¼ acre or tires used in farming operations,
- oil production related wastes,
- salvage yards,
- surface impoundments with a KPDES permit, and
- one-time disposal of waste construction or demolition material at the place of generation.

When a permit-by-rule site is in known violation of the EPS, the permit-by-rule is revoked, the site is required to modify its operation to conform to the EPS and obtain a permit or close.

**Beneficial reuse** of solid waste encompasses a one-time disposal of demolition wastes such as concrete slabs, brick, concrete block, or similar material, or coal ash and steel slag to provide structural inert support for buildings

**Registered Permit-by-Rule** category of solid waste sites or facilities requires the registration of certain types of management, processing, or disposal facilities. The purpose of this registration is to identify additional facilities for the management and measurement of Kentucky's waste stream.

Facilities that fall under this category include:

- < 1 Acre C/D/D landfills,
- recovered materials processing facility” in KRS 224.01-010
- transfer stations,
- solid waste incinerators with a design capacity of more than 1 ton per day,
- sludge giveaway programs,
- Class 1 landfarming sludges,
- septic tank pumpings, and
- convenience centers.

Registered Permit-by-Rule Facilities must submit a registration form to the Division, comply with the Environmental Performance Standards and applicable operating standards, and implement any necessary corrective action. New facilities must run a public notice and register prior to startup of operation. The owner/operator may begin operations 5 days after registration without a response by the Cabinet. The Cabinet has 5 days to deny the registration if the registration is deemed incomplete or inaccurate.

**Emergency permits** are issued in accordance with 401 KAR 47:150 for the short term storage of solid waste generated in an emergency situation.

**Research, development, and demonstration permits** are issued to facilities to demonstrate unproven technologies.

## **CHAPTER 3**

### **WASTE STREAM COMPOSITION AND DECOMPOSITION**

#### Chapter 3 Behavioral Objectives

1. Differentiate between the types of waste.
2. Understand the restrictions for landfills in acceptance of waste.
3. Explain decomposition of waste and the byproducts of this decomposition.
4. Understand the environmental impact of landfill gases.
5. Explain the production of leachate and how leachate is affected by the amount of water in the fill and the regulations relating to each.
6. Understand the movement of gas and leachate and its impact on landfills.
7. List the systems used to control landfill gas and leachate control.
8. Identify five sources of unacceptable waste streams in landfills.
9. Demonstrate knowledge of the operating permit and how it relates to the types and geographic source(s) of waste origination that landfills are approved to receive.
10. Identify wastes that require specific written approval for receipt.
11. List the types of and describe unacceptable disposable waste streams.
12. Outline the types of waste that require special handling.
13. Explain the necessity for waste stream testing and list the tests used to determine if waste is acceptable.



## CHAPTER 3

### WASTE STREAM COMPOSITION AND DECOMPOSITION

Solid wastes are classified according to types and properties. This section describes wastes that are acceptable, unacceptable; require special handling, and/or special permission for disposal at different types of landfills. Solid waste is produced from various sources including households, businesses, and farms. Outlined below are examples of wastes produced from each of these sources and their chemical properties and decomposition.

#### Types of Waste

People dispose of many different types of waste. Not all landfills are permitted to accept all waste that can be generated by certain households, businesses and industries. Before we discuss which wastes are acceptable at certain landfills, it is important to understand the differences in waste streams. The following types of wastes are generated on a daily basis:

**Solid wastes** (as defined by KRS 224.01-010): Any garbage, refuse, sludge, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining (excluding coal mining wastes, coal mining by-products, refuse and overburden), agricultural operations, and from community activities, but does not include those materials including, but not limited to sand, soil, rock, gravel, or bridge debris extracted as part of a public road construction project funded wholly or in part with state funds, recovered material, special wastes as designated by KRS 224.50-760, solid or dissolved material in domestic sewage, manure, crops, crop residue, or a combination thereof which are placed on the soil for return to the soil as fertilizers or soil conditioners, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Pollution Control Act, as defined by the Atomic Energy Act of 1954, as amended (68 stat. 923).

#### Municipal Solid Waste

**Residential waste** consists of both putrescible and non-putrescible waste generated by households. Household Solid Waste: Solid waste, including garbage and trash generated by single and multiple family residences, hotels, motels, bunkhouses, ranger stations, crew quarters, and recreational areas such as picnic areas, parks, and campgrounds. The average density of this waste is 500 to 1,000 lbs. per cubic yard as it enters the landfill. This type of waste must be disposed of at a contained landfill and will contain:

- food wastes, which are putrescible (decay or rots quickly). These wastes attract flies and rats and can cause odors,

- paper and packaging,
- hazardous waste such as paint thinners, drain cleaner, pesticides, etc., generated by households, (batteries must go to a recycler)
- bulky items (furniture appliances, white goods), and other bulky items that can be difficult to handle and compact.
- must be disposed of in contained landfills, and
- average density is 500 to 1000 lb./cubic yard as it enters the landfill,

**Commercial waste** is generated by stores, offices, restaurants, warehouses, and other service and non-manufacturing activities, excluding household and industrial waste. Examples include: food, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, tin cans, aluminum, ashes, leaves, tires, white goods, furniture, household hazardous waste, etc. This waste is primarily disposed of at a contained landfill. It is difficult to get a good compaction rate for this waste and it is slow to decompose. The average density is 200 to 700 lbs. per cubic yard.

This waste may contain:

- contains a large amount of paper and packing materials (i.e., paper, plastic, cans, etc.) and some wood which are combustible and have the potential to catch on fire,
- slow to decompose,
- difficult to get good compaction, and
- primarily disposed of at contained landfills but some non-putrescible wastes may go to construction/demolition/debris landfills
- average density is 200 to 700 lb./cubic yard,

**Institutional wastes** are wastes generated by schools and hospitals. This waste must be disposed of in contained landfills.

This waste contains:

- large amounts of both food wastes and paper/packaging wastes,
- regulated hazardous wastes such as laboratory chemicals,
- needles, bandages, body parts, bedding, etc., and
- infectious wastes, which are not classified as hazardous wastes.

**Medical (Biohazard/Infectious) Waste** results from the operation of hospitals, and nursing homes, and may cause disease or reasonably be suspected of harboring pathogenic organisms. Examples include: diseased human parts, contaminated bandages, pathological specimens, hypodermic needles, contaminated clothing, surgical gloves, etc.

- Hospitals and nursing homes generate medical wastes such as needles, bandages, body parts, bedding, etc., and
- Infectious wastes not classified as hazardous wastes and may be disposed of in contained landfills.

**Construction/Demolition and Debris Waste** results from the construction, remodeling, repair, and demolition of structures and roads. This waste consists primarily of building materials and rubble, is relatively inert with the exception of wood and does not compact well (it ranges widely). Examples include: bricks, concrete and other masonry materials, wood, rock, uncontaminated soil, wall coverings, drywall, plumbing fixtures, metals, furniture, shingles, insulation, etc. Asbestos from these buildings may only be disposed of in a contained landfill

- consist of waste building materials and rubble,
- relatively inert with the exception of wood, and
- primarily disposed of in construction/demolition/debris landfills.

**Special wastes** (as defined in KRS 224.50-760): Those wastes of high volume and low hazard. Examples include: mining wastes, utility wastes (fly ash, bottom ash, and scrubber sludge), sludge from waste and wastewater treatment facilities, cement kiln dust, gas and oil drilling muds, oil production brines, etc. Any waste not listed in the law may only be considered special waste if the generator files and Cabinet approves a petition stating that the characteristics are present:

- Waste exhibits the characteristic of high volume as determined by:
  - a. Non-liquid wastes that are generated at an average annual rate of greater than 49,614 tons or 45,000 metric tons per year per Kentucky facility.
  - b. Liquid wastes that are generated at an average annual rate of more than 1,000,000 metric tons per year per Kentucky facility.
- Waste exhibits the characteristic of low hazard if:
  - a. There is a low probability that the management, processing, or disposal of the waste would violate the provisions of 401 KAR 30:031.
  - b. The waste is not a hazardous waste as defined in 401 KAR chapter 31.
  - c. The waste is not mixed with, co-disposed or co-treated with solid waste or hazardous waste.

**Sewage Treatment Plant Residues** are wastes generated from the sewage treatment process. However, septic tank pumpings cannot be accepted at solid waste landfills without the addition of bulking agents, which will ensure that they pass the paint filter test. This is due to the large amount of free liquids this waste contains.

These residues:

- contain coarse screenings and de-watered sludge,
- require an additional waste stream approval from the landfill operator prior to disposal,
- may present a fire hazard in large accumulations.

**Waste tires** generated by households, dealers, junkyards, and other businesses other than tire-manufacturing industries are considered both municipal solid wastes and waste tires under the law.

**Petroleum contaminated soil** is considered a municipal solid waste unless it is the by-product of a manufacturing process.

### **Industrial/Residual Waste**

Solid waste generated by manufacturing or industrial processes that is not a hazardous waste or a special waste. Examples include: waste from fertilizer or agricultural chemical manufacturing, wastes from plastics and resin manufacturing, waste from the pulp and paper industry, water treatment sludge, waste from air pollution control devices, etc. This term does not include residential like wastes that come from offices, lunchrooms and packaging (unless packaging is what is being made at a particular facility). Industrial waste should be disposed of in a contained or residual landfill.

Some examples of industrial wastes are:

- sludges (paint waste, water treatment),
- dusts (air pollution control),
- cuttings, grindings, stampings, product rejects, and
- contaminated soils if they result from an industrial process.
- large amounts of paper/packaging wastes, and
- may contain regulated small quantity hazardous wastes such as laboratory chemicals, if disposed in a contained landfill.

### **Farming/Agricultural Wastes**

Agricultural wastes are non-hazardous wastes generated from the production and processing of on the farm agricultural products. Similar wastes produced by racetracks, tree services, or other businesses are not considered agricultural waste.



**Manure and crop residues** are exempt from the definition of solid waste when returned to the soil as fertilizer or soil conditioners in practices common for this use.

**Herbicides and pesticides** are not classified as agricultural wastes. Empty containers must be triple rinsed before they may be disposed of at a solid waste landfill. Furthermore:

- pesticides residues are not regulated hazardous wastes when disposed of in accordance with label instructions, and
- only a farmer disposing of pesticide residues from his own use is exempt.

### **Hazardous Waste**

**Hazardous Wastes (as defined in KRS 224.01-010):** Any discarded material or material intended to be discarded or substance or combination of such substances intended to be discarded, in any form, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed or, or otherwise managed. Examples include: paint wastes, discarded chemicals, discarded pesticides, spent solvents, incinerator ash, electroplating wastes, etc. (see 401 KAR 31:030 and 401 KAR 31:040). Manufacturing facilities, small businesses, and institutions such as hospitals, schools and universities typically generate hazardous wastes. A waste is classified as a hazardous waste if it is listed or testing shows, it meets the characteristic of a hazardous waste. The regulations related to hazardous waste determinations can be found in 401 KAR Chapter 31.

- Listed wastes include wastes generated by nonspecific industrial operations such as degreasing solvents, other spent solvents, electroplating operations, and specific sources such as petroleum refiners, wood preservers, etc.
- Discarded commercial products, off specification chemicals, container residues and spill cleanup residues may also be listed hazardous waste
- Some of the wastes described in the preceding paragraph are considered to be “acutely toxic” and become regulated when as little as one quart is generated
- Hazardous waste characteristics in general terms are as follows:
  - a. Ignitable wastes are liquids with a flash point below 140°F
  - b. Corrosive wastes are aqueous liquids with a pH below 2.0 and greater than

- c. Reactive wastes are unstable under normal conditions and can explode or react violently with water to explode or produce toxic gases.
- d. Toxic wastes can leach designated contaminants when subject to the toxicity characteristic leaching procedure (TCLP) test. This test is designed to simulate landfill conditions.

**Limited Quantity Generators:** Persons who generate less than 220 pounds of hazardous waste in any one-month are conditionally exempt small quantity generators. Hazardous wastes from this type of facility are exempt from hazardous waste regulations. Therefore, they are acceptable for disposal at some contained landfills. Small quantity (220 to 2,200 pounds) and large quantity (over 2,200 pounds) generators either must handle hazardous waste onsite or ship wastes to a permitted hazardous waste treatment, storage, disposal, or recycling facility.

- Do not accept any waste accompanied by a hazardous waste manifest.
- Division of Waste Management field office must be notified immediately when actual or suspected hazardous waste is found during random inspections or during unloading.

Random inspections are an important method to detect these wastes and prevent their disposal at a solid waste landfill.

### **Waste Composition**

The composition of waste varies widely between household, commercial and industrial discards. For an average community in the United States, waste composition is 18.5 percent organic (glass, metal) and 81.5 percent organic (paper, plastics, rubber, leather, textiles, wood, food, and yard waste). The U.S. Environmental Protection Agency quotes these estimates.

Seasonal variations in waste composition affect the amount of waste generated. An example of a seasonal variation is yard wastes, which are a major component of residential waste in the summer months but practically non-existent in the winter.

Recycling can also have an important impact on the waste stream. As certain materials are recovered (such as newspaper, cardboard, and aluminum) the amount and composition of waste changes. Waste composition is also subject to change as one type of material displaces another and/or consumer buying habits change (e.g. plastic bottles or aluminum instead of glass).

## **Waste Decomposition**

Wastes are decomposed both through chemical reactions with landfill liquids and the action of bacteria and other microbes that occur naturally in the environment.

Organisms feed on organic materials found in garbage breaking them down into end products consisting primarily of:

- CO<sub>2</sub> (carbon dioxide),
- NH<sub>4</sub> (ammonia),
- CH<sub>4</sub> (methane),
- Humus, and
- H<sub>2</sub>O.

The biological decomposition of solid waste follows three distinct phases:

### **PHASE 1:**

The microorganisms slowly degrade the complex organic portions of the waste using the O<sub>2</sub> trapped during the landfilling process to form simpler organic compounds, CO<sub>2</sub> and water. This phase is termed aerobic decomposition.

### **PHASE 2:**

After the CO<sub>2</sub> is fully consumed, bacteria grow and decompose waste into simpler molecules such as hydrogen, ammonia, CO<sub>2</sub> and organic acids. This second phase is step one of the anaerobic phase.

### **PHASE 3:**

In the third decomposition phase (step two of anaerobic phase), CH<sub>4</sub> forming bacteria (methanotrops) utilize CO<sub>2</sub>, hydrogen and inorganic acids to form CH<sub>4</sub> gas and other products.

Chemical reactions between wastes placed in landfills may also take place producing volatile constituents.

Complete decomposition may take fifty years or more. However, conditions are such that rapid decomposition occurs mainly within the first five years.

## **Landfill Gas**

The gaseous end products produced in the most significant quantities are as follows.

### **CARBON DIOXIDE (CO<sub>2</sub>)**

- Is highly soluble in water, forms carbonic acid,
- Dissolves iron from metal cans and lime from materials containing calcium,
- Increases the hardness of water (including groundwater), and
- Is odorless and colorless.

### **METHANE (CH<sub>4</sub>)**

- Travels upward through fill or along the path of least resistance into the atmosphere, pipes or building,
- Not very soluble in water,
- Explosive, and
- Odorless, colorless and tasteless.

### **HYDROGEN SULFIDE (H<sub>2</sub>S)**

- Creates odors (rotten egg) and a foul taste when dissolved in water, and
- In the presence of dissolved oxygen in the water, sulfide will be oxidized to tasteless and odorless sulfur and sulfates.

## **Environmental Impact of Landfill Gas**

There are increasing concerns with the emissions of Landfill Gas (LFG) and its contribution to air pollution since volatile emissions from landfills represent a major source of organic contaminants entering the atmosphere. The concerns are based on the following:

- CH<sub>4</sub> gas is highly combustible, making it a potential hazard in the landfill environment, or in structures on adjacent properties,
- LFG is capable of migrating significant distances through soil, thereby increasing the risk of explosion and exposure. Serious accidents resulting in injury, loss of life and extensive property damage may occur where landfill conditions favor gas migration,
- As LFG is produced, the pressure gradient upward may create cracks and disrupt the geomembrane in the landfill cover,
- CH<sub>4</sub> gas is an asphyxiate to humans and animals in high concentrations. Migrating gas may result in other adverse effects such as stress to vegetation by lowering the O<sub>2</sub> content of soil gas available in the root zone,
- Gas generated at landfills and vented to the atmosphere frequently release nuisance odors causing annoyance to individuals residing nearby,
- Emissions of Non-Methane Organic Compounds (NMOC) and Reactive Organic Gases (ROG), contained in LFG, may be contributing to the degradation of local air quality.
- NMOC's include:
  - ✓ Benzene,
  - ✓ Toluene,
  - ✓ Ethyl benzene,
  - ✓ Vinyl chloride,
  - ✓ Dichloromethane,
  - ✓ Trichloroethylene,
  - ✓ 1,2,-cis Dichloroethylene, and
  - ✓ Tetrachloroethylene.
- Where landfills contain sources of sulfur, such as shredded construction/demolition material and gypsum board, there is increases potential for liberation of H<sub>2</sub>S, which is noxious at low concentrations and can cause asphyxiation if gas is migrating to enclosed areas,

- Vinyl chloride from landfills has been found to be present in substantial concentrations in LFG's and has been detected in off site conduits, representing health and safety concerns. Vinyl chloride is found in municipal as well as commercial solid waste landfills,
- CH<sub>4</sub> gas, one of the "green house gases", contributes to the possibility of global warming of the earth's climate, and
- Uncontrolled LFG is a loss of potential resources. Instead it can be a satisfactory fuel for a wide variety of applications. Many types of energy equipment designed for conventional fuels can operate on LFG with the power output reduced about five to twenty percent.

### **Leachate Generation**

In addition to the gases, landfills produce leachate. The amount of leachate generated is directly affected by the amount of water that is allowed to enter the fill.

Water can enter the fill through:

- Moisture and liquids contained in wastes,
- Poor surface water control,
- High water table, and
- Inadequate cover.

The entire landfill does not have to be saturated for leachate to be produced especially when water enters the fill from below.

Leachate usually contains elevated levels of:

Iron	Organic Carbon (TOC)
Chloride	Dissolved Solids
Sodium	Phosphorus
Calcium	Nitrogen
Magnesium	Biological Oxygen Demand (BOD)
Sulfates	Acid
Metals	

Many studies indicate that leachate often contains Volatile Organic Compounds (VOCs). In 1988, EPA prepared a Congressional report on solid waste disposal. In this report, leachate studies from 70 municipal landfills were combined to characterize landfill leachate. The studies reported finding 82 chemicals in landfill leachate, including 63 types of organic chemicals. In

the 70 landfill studies, concentrations of VOCs in leachate varied widely, but the researchers were able to calculate a median concentration for each chemical by averaging all of the data. Of the fourteen chemicals whose median concentrations exceeded federal drinking water standards, twelve are known or probable carcinogens and two are considered toxic to humans (see Table 1 for a list of common VOCs)<sup>2</sup>.

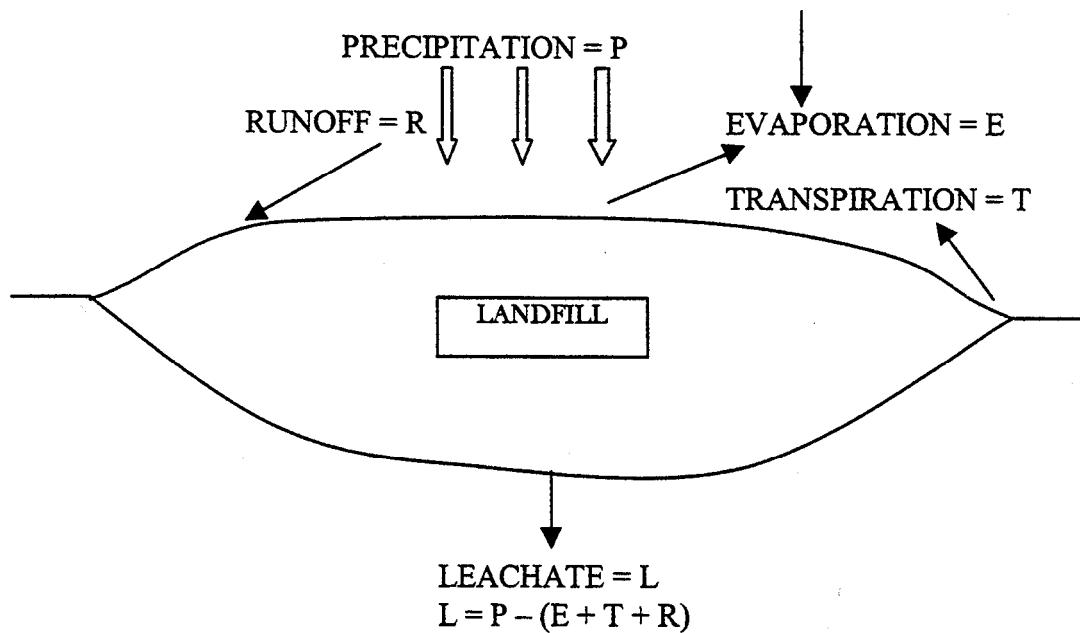
Therefore, the manager must ensure the proper pumping, hauling and treatment of landfill leachate in order to protect human health and the environment.

FIGURE 5-1

TABLE 1 Health Effects of Selected Volatile Organic Chemicals Found in Landfill Leachate	
Benzene	Human carcinogen, mutagen, and possible teratogen; central nervous system (CNS), peripheral nervous system, immunological and gastrointestinal effects; blood cell disorders; allergic sensitization; eye and skin irritation
Chloroform	Probable human carcinogen and possible teratogen; CNS and gastrointestinal effects; kidney and liver damage; embryotoxic; eye and skin irritation
1,1-dichlorethane	Embryotoxic; CNS effects; kidney and liver damage
Ethylbenzene	CNS effects; kidney and liver damage; upper respiratory system, eye and skin irritation
Methylene Chloride	Possible carcinogen; CNS, lung/respiratory system and cardiovascular effects; blood disorders; eye and skin irritation
Tetrachloroethylene	Probable carcinogen; CNS and lung/respiratory effects; embryotoxic; kidney and liver damage; upper respiratory tract and eye irritation
Toluene	Possible mutagen and carcinogen; CNS and cardiovascular effects; kidney and liver damage; upper respiratory tract, eye and skin irritation; and allergic sensitization
Trichloroethylene	Possible carcinogen and teratogen; CNS, kidneys, liver, cardiovascular system, and lung/respiratory system effects; blood cell disorders; skin, eye and upper respiratory irritation
1,1,1-trichloroethylene	Carcinogenic; mutagenic; CNS and lung/respiratory effects; kidney and liver damage; eye and skin irritation
Vinyl Chloride	Carcinogenic; mutagenic; possible teratogen; CNS effects; kidney and liver damage; blood cell disorders; skin irritation
Xylene	CNS and cardiovascular effects; kidney and liver damage; upper respiratory and eye irritation

**SOURCE:** Adapted from *The Poisoned Well* (Sierra Club Legal Defense Fund, 1989)



**FIGURE 5-2**

### **Movement of Gas and Leachate**

Gas and leachate follow the path of least resistance and move more freely through permeable materials. Examples of highly permeable materials are sand and gravel, which are large, grained and have enough air space between grains to allow water and gas to move easily. Clay and shale have low permeability and slow the passage of water.

Several factors contribute to the effect that contaminants, found in leachate, may have on the environment:

- Permeability of surrounding soils or the ability of soils to allow liquids to pass through,
- Layers of rock under the site,
- Ability of the soil and rock layers surrounding the site to physically filter or form a chemical bond with contaminants,
- Depth of water table,
- Direction and rate of groundwater flow, and
- Concentration of contaminants.

Figure 5-3

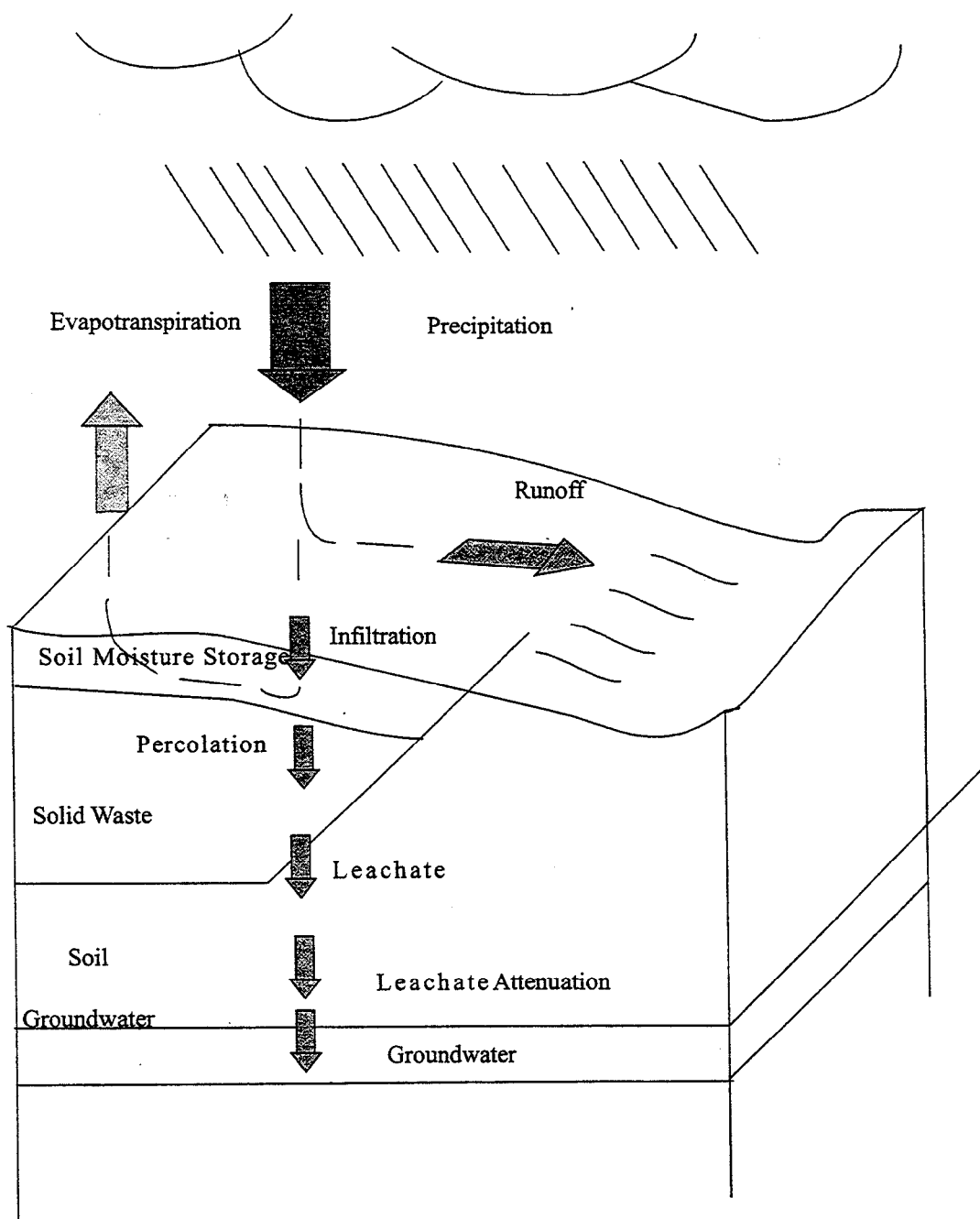
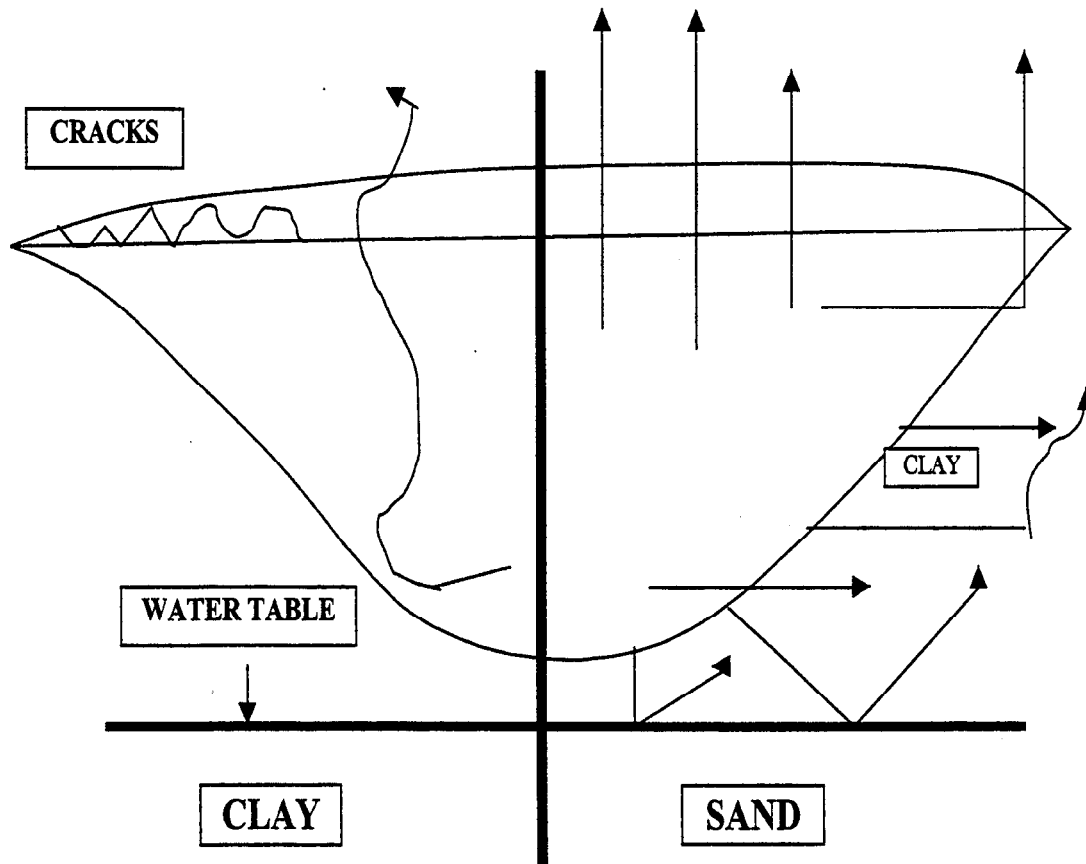


FIGURE 5-4



The presence of restrictive layers including frost, saturated soil, clay or synthetic caps will reduce vertical and potentially increase horizontal migration.

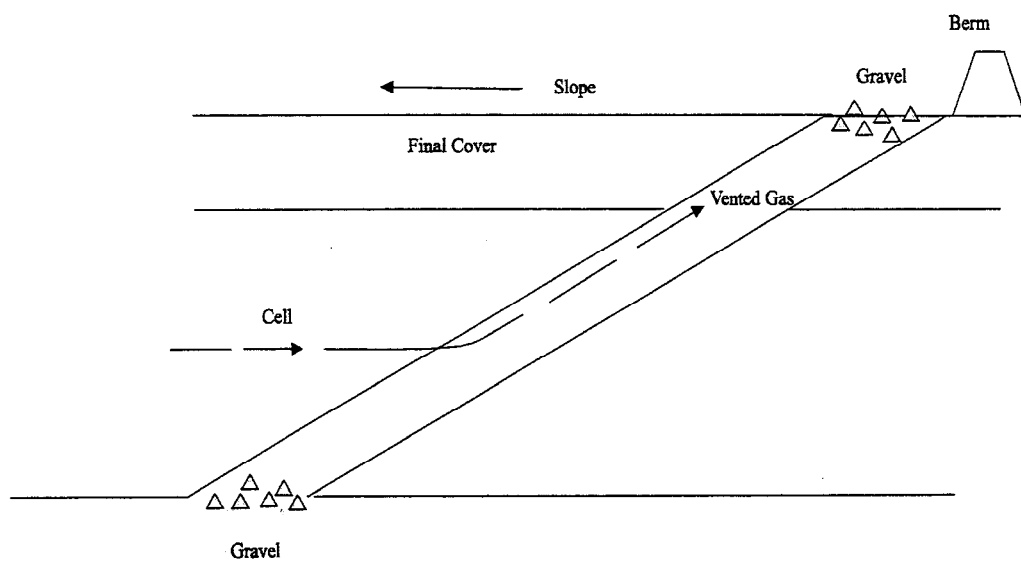
### Gas Control

Generally, there are two types of systems to control migration of landfill gas. These are active and passive systems.

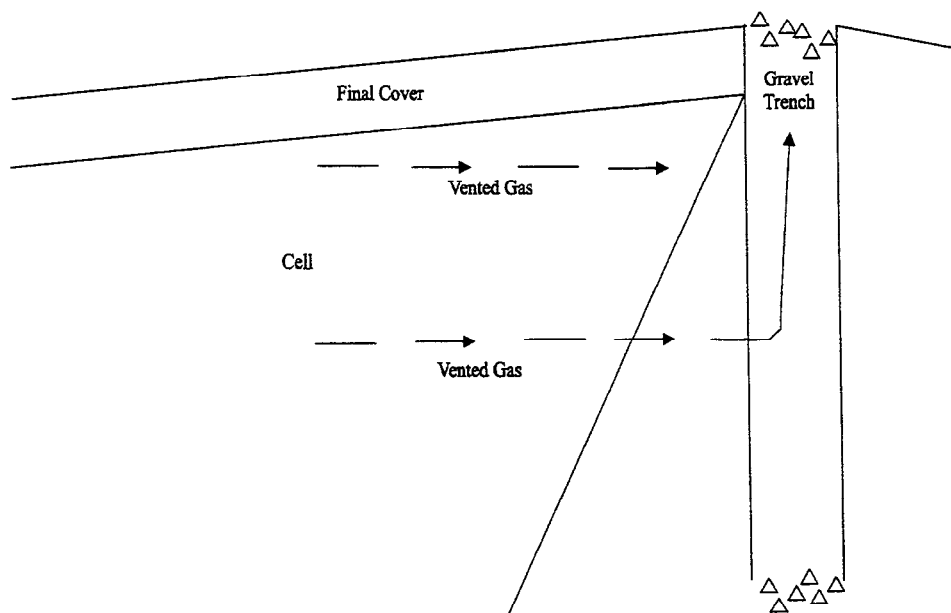
**Passive Systems** are vents or barriers built into or adjacent to the fill that collect gas for release to the atmosphere.

**Active Systems** are a series of pipes connected to a blower to draw methane out of the landfill and collect it for flaring or energy use.

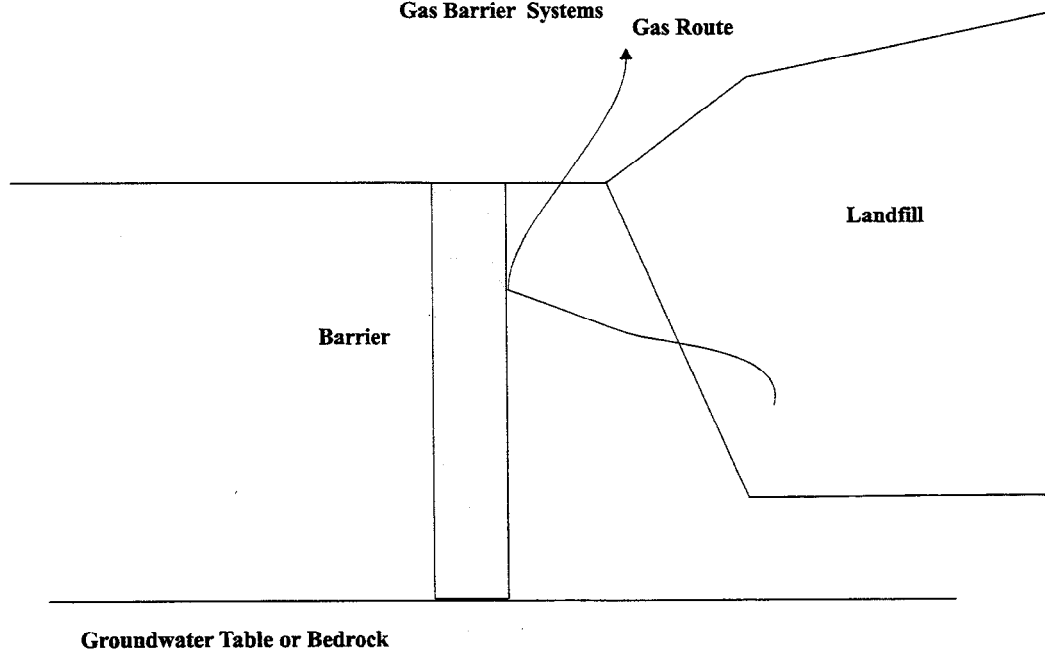
Figure 5-5  
Passive Venting Systems



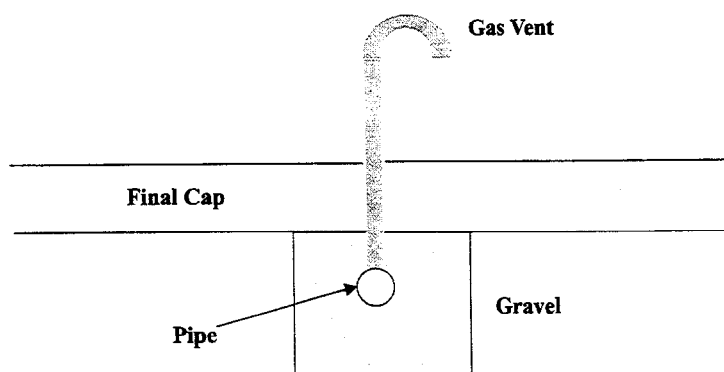
System for Residential, Residual, Special Waste and Non-Putrescible CDD Landfills



**Figure 5-6**  
**Gas Barrier Systems**



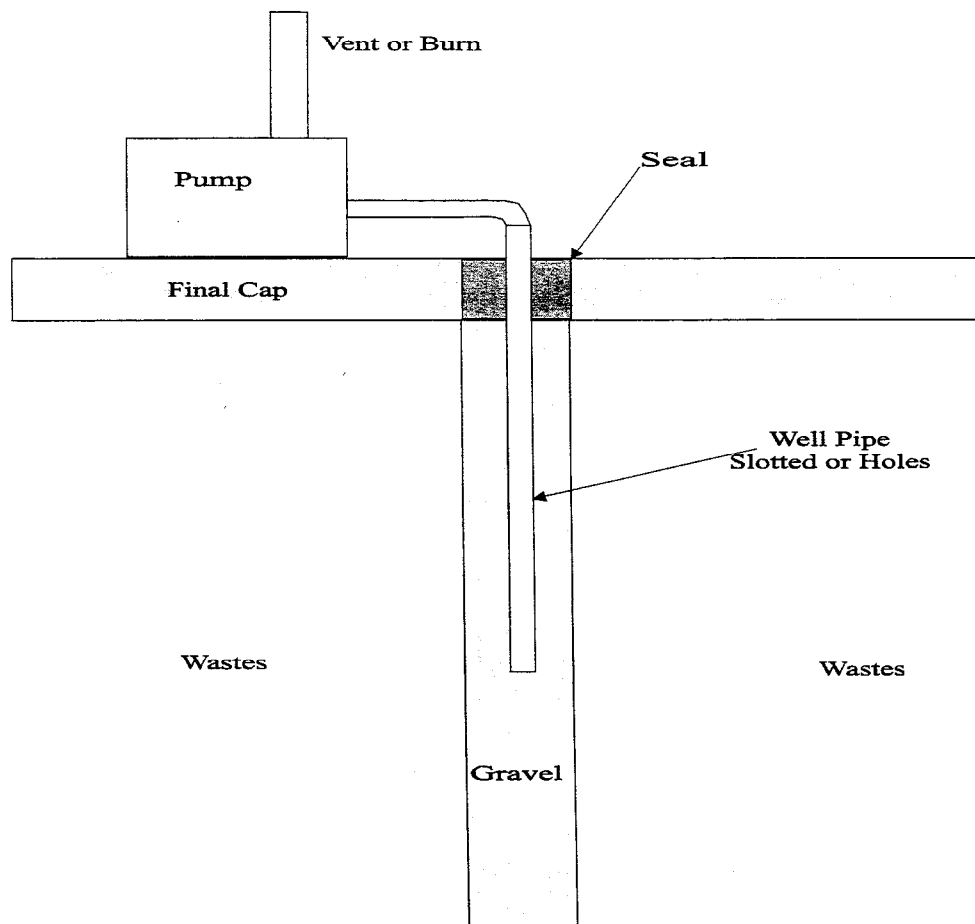
**Figure 5-7**  
**Passive Pipe Design**



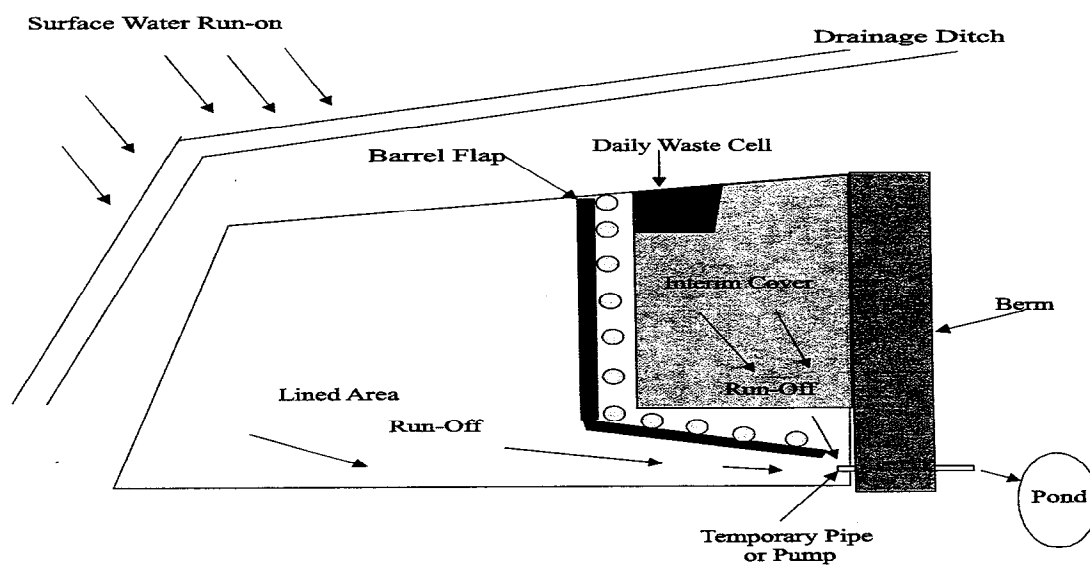
## **Leachate Control**

The most effective method of leachate control is to provide good drainage, high compaction of wastes and practice good surface water management. Newly developed contained landfills are required to install leachate collection systems. As discussed in Chapter 4, a composite liner consists of a leachate collection system. This system includes drainage provisions to promote runoff, pipes to provide collection of leachate flowing vertically and horizontally, and a tank for storage of the liquid collected until removal or treatment may occur.

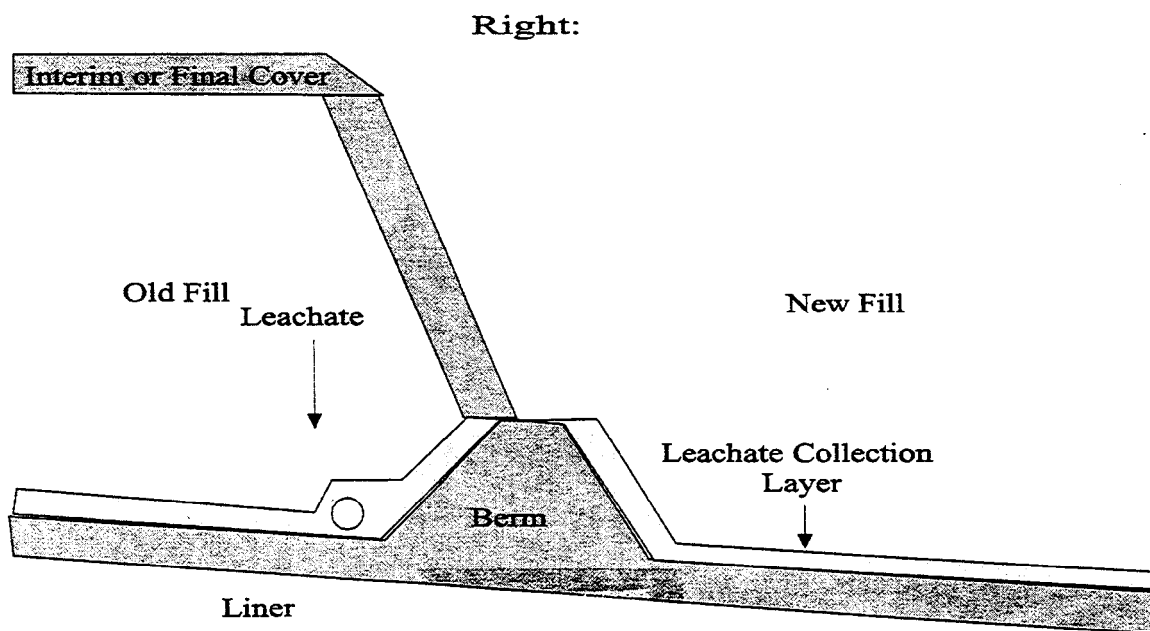
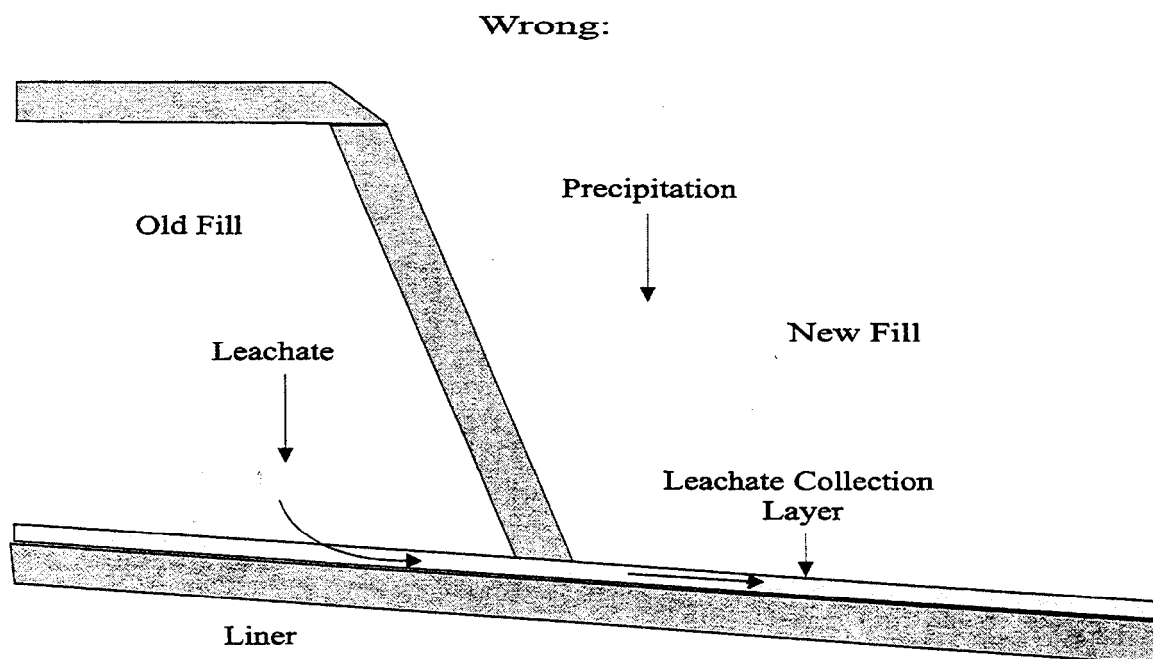
**Figure 5-8**  
**Active Methane Control System**



**Figure 5-9a**  
**Surface Water Control Methods**



**Figure 5-9b**  
**Drainage Control Using Berms**





**Figure 5-10**  
**Landfill with Leachate Collection**

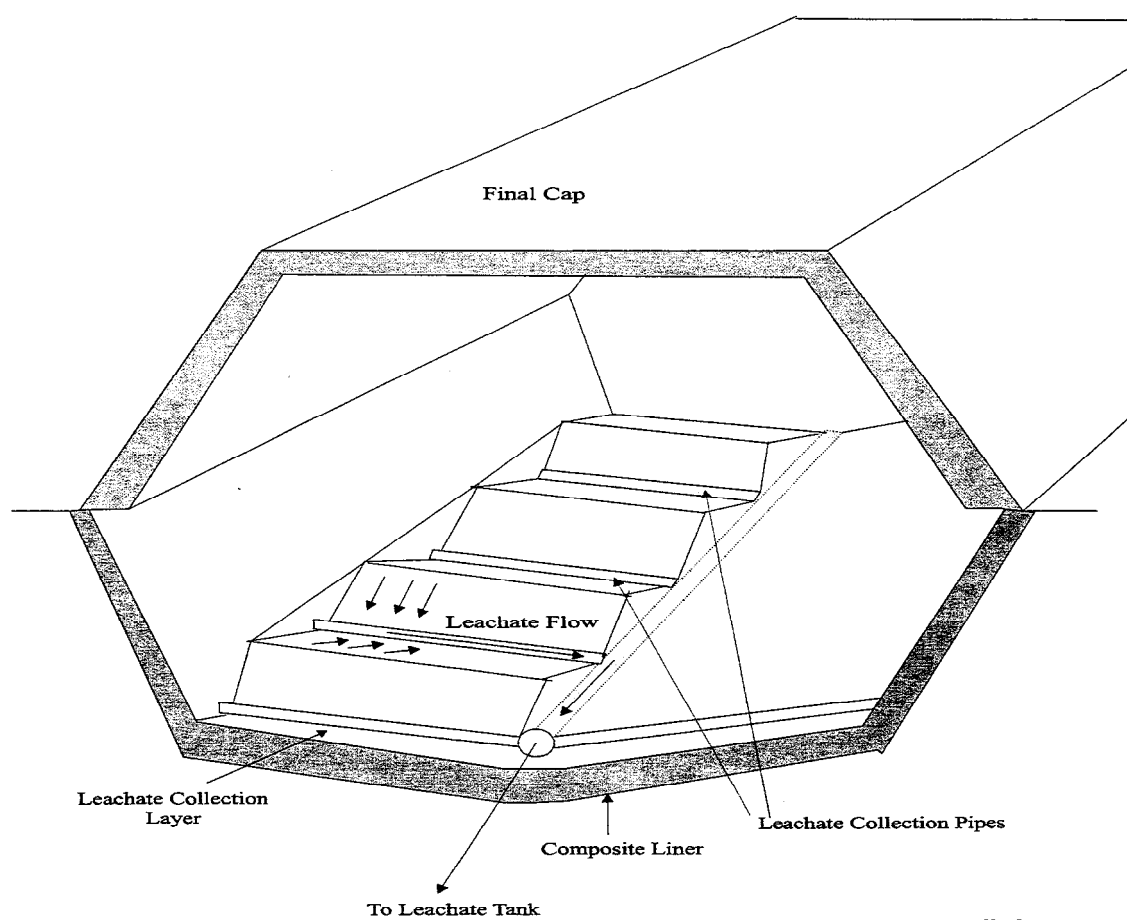


Figure 5-10 shows a cross section of a landfill with a leachate collection system installed.

## Gas Regulations

The United States Environmental Protection Agency (EPA) has issued regulations for control of air emissions from MSW landfills, based on section 111 the Clean Air Act (CAA). The federal government proposed the amendments to 40 CFR 60 by adding subparts CC and WW on May 30, 1991 at 56 FR 2448 and finalized them on March 12, 1996 at 60 FR 9918. The regulations require gas management systems as a component of the landfill final cover. Visit the following websites for more information:

- U.S. EPA Office of Air Quality Planning & Standards, Unified Air Toxics Website: Rule and Implementation Information for Standards of Performance for Municipal Solid Waste Landfills (Docket # A-88-09)

<http://www.epa.gov/ttn/uatw/landfill/landflpg.html#RULE>

- The Landfill Gas Page

<http://www.mclink.it/personal/MD1337/home.htm>

## Definition of a “New” Landfill

The New Source Performance Standards (NSPS) applies to “new” landfills. A “new” landfill is defined as a landfill that commenced construction, modification, or reconstruction on or after **May 30, 1991**. The Emission Guidelines (EG) applies to “existing” landfills. An existing landfill that commenced construction before May 30, 1991, but began accepting waste after May 1991 would be subject to the EG rather than the NSPS. If an existing landfill has been or is “modified” on or after May 30, 1991, it will be subject to the provisions of the NSPS. The definition of “modification” specific to landfills is included in the landfill NSPS (§ 60.751) and is based on the landfill’s design capacity. A modification is an increase in the permitted design capacity caused by an increase in the constructed horizontal or vertical dimensions of the landfill. Each new landfill with a design capacity below **2.5 million megagrams (Mg) or 2.5 million cubic meters (m<sup>3</sup>)** is exempt from most of the requirements in this rule. A small landfill with a capacity below the exemption level is required only to submit an Initial Design Capacity Report to the implementing agency (§ 60.752(a)).

## The Affect of New Source Review on Landfills

In addition to the NSPS, landfills may be subject to the **New Source Review (NSR)** requirements of the Act. The NSR program requires the preconstruction review of major new sources and major modification. The review includes a control technology review and an analysis of the air quality impacts of the new or modified source. New landfills that are major sources and existing landfills that make modifications that result in significant emissions increases are subject to major NSR requirements. For example, a landfill may install a combustion device to control NMOC, but simultaneously increase secondary emissions.

However, there is an exemption of NSR that may be available to an existing landfill that would otherwise trigger NSR. This Pollution Control Project (PCP) exclusion was established to allow states to exempt from major NSR PCP's that are on balance "environmentally beneficial".

### **Regulatory Standards**

The provisions of the NSPS apply to all "new" landfills with a maximum design capacity equal to or greater than **2.5 million Mg** and **2.5 million m<sup>3</sup>**.

### **The Determination of Controls for Landfills**

Control requirements for a landfill are determined by calculating the NMOC emission rate from the landfill. The NMOC emission rate has been selected as a surrogate for LFG emissions. Each landfill that is at least **2.5 million Mg** and **2.5 million m<sup>3</sup>** in design capacity must perform an initial NMOC emissions rate calculation until the landfill has installed a gas collection and control system according to specifications in the rule.

If the landfill NMOC emission rate is determined to be equal to or **greater than 50 Mg/yr**, the landfill owner or operator is required to **install a gas collection and control device** to reduce the landfill NMOC emissions [§ 60.752 (b)(2)]. If the landfill NMOC emission rate is determined to be **less than 50 Mg/yr**, then the landfill only needs to **calculate and report its NMOC emission rate** periodically. An NMOC Emission Rate Report is submitted each year until such time as the recalculated NMOC emission rate is equal to or greater than 50 Mg/yr or the landfill ceases to accept waste [§60.752(b)(1)]. These factors are described in greater detail in the background information document (BID) published at proposal and entitled "Air Emissions from Municipal Solid Waste Landfills – Background Information for Proposed Standards and Guidelines" (EPA-450/3-90-011a).

### **Environmental Performance Standards**

**Air Pollution:** No solid waste site or facility shall violate **applicable air pollution requirements** contained in KRS chapter 224 or 401 KAR chapters 50 through 63 (401 KAR 47:030 section 10(2) and 30:031 section 10(2))

**Safety for Explosive gases:** No solid waste site or facility shall allow the concentration of explosive gases generated by the facility to exceed:

- Twenty-five percent of the lower explosive limit (LEL) for the gases in facility structures (excluding gas control or recovery system components), and

- The LEL for the gases at the facility property boundary (401 KAR 47:030 section 11 and 30:031 section 11).

### **Acceptable Disposable Waste Streams**

The landfill-operating permit identifies the types and geographic source(s) (county/state of waste origination) of wastes a landfill is approved to receive. Once the permit is issued, any waste described from any geographical source, listed on the permit, may be accepted without further written approval.

**Household hazardous wastes** are leftover or unwanted commercial products used in the home. They have the same hazardous properties as regulated industrial hazardous wastes but are not regulated when generated by households. This means they can ignite or catch fire; react or explode when mixed with other substances; irritate or burn skin; or they are toxic and can adversely affect human health. Household hazardous wastes have the potential to pollute the air and water when disposed of in any landfill other than a contained landfill or flushed down the drain.

Examples include:

- paints,
- pesticides,
- herbicides,
- solvents, and
- caustics, etc.

### **Wastes Requiring Specific Written Approval**

For contained landfills, any non-residential like waste (waste that does not originate from a household) stream must be approved at the landfill before disposal. The waste must first be characterized and a TCLP or paint filter test conducted.

**Asbestos wastes** can be generated from manufacturing, fabricating, demolition, renovation and spraying operations. Any exposure to airborne asbestos particles for even a short amount of time increases the risk for an adverse health impact. The Division of Air Quality regulates the removal and handling of asbestos before disposal. Outlined below are the regulatory requirements relative to treatment and disposal of asbestos containing material (ACM).

- ACM must be wetted down, placed in two 6 mil. plastic bags and sealed in rigid containers before transporting to the landfill. Either fiber or metal drums are acceptable.
- When ACM wastes are not transported in sealed, rigid containers the transported must have a written waiver from the Division of Air Quality. Bags of ACM waste should not be accepted without a written waiver.
- Drums and bags must be marked with a caution label.
- Do not allow trucks containing ruptured bags to unload.
- Drums must be handled and disposed of in a manner that prevents breaking open containers during unloading and covering.
- The location and placement of ACM should be clearly identified in facility records. These records should document the X, Y and Z coordinates (horizontal, vertical and depth) of the ACM waste.

**Sludges** are defined as solids, semi-solids or dusts generated by wastewater treatment units and air pollution control devices. In order to be disposed of in a landfill, sludge cannot contain any free liquids and be hazardous. It may be necessary to perform a TCLP and paint filter test to determine suitability for landfill disposal.

**Limited Quantity Generator of Hazardous Waste** is anyone who generates less than 220 pounds of hazardous waste per month.

These wastes may be disposed of in contained landfills provided:

- the waste passes the paint filter test,
- limited quantity hazardous wastes are listed as a waste type in the permit,
- the facility generating the wastes is listed in the permit, and
- The location and placement of LQGHW should be clearly identified in facility records. These should document the X, Y, Z coordinates of the LQGHW wastes.

**Contaminated Soils** are soils that are not suitable for cover. During the clean up of spills and releases, contaminated soils and other debris may be generated. One of the most common sources of this waste is soil generated during the removal of underground storage tanks. The following guidelines should be adhered to when receiving these wastes:

- **do not accept any** contaminated soils unless you know the source of contamination and the soil has been analyzed (TCLP) to demonstrate it is not a regulated hazardous waste,
- PCB spills of oils containing less than 50 ppm PCB may be disposed of at a contained landfill,
- petroleum contaminated soils generated during the removal of underground storage tanks are not a hazardous waste; however, other gasoline contaminated soils must be tested for a hazardous waste determination, and
- petroleum contaminated soils may be used for daily cover if the maximum benzene concentration is equal to or less than 1.0 ppm and if the material is not placed during a precipitation event.

### **Unacceptable Disposable Waste Streams**

**Unpermitted Geographic Source Waste:** Any waste from a city, county or other geographic source not specifically listed in the permit cannot be accepted. An add/delete waste source application must be filed with and approval received from the Division before acceptance at a landfill.

**Hazardous Waste:** Manufacturing facilities, small businesses and institutions such as hospitals, schools and universities typically generate hazardous wastes. A waste is classified as a hazardous waste if it is listed or testing shows, it meets the characteristic of a hazardous waste and exceeds the small quantity limit of 2.2 or 220 lbs/mo. Regulations related to hazardous waste determinations can be found in 401 KAR Chapter 31.

- listed wastes include waste generated by nonspecific industrial operations such as degreasing solvents, other spent solvents, electroplating operations, and specific sources such as petroleum refiners, wood preservers, etc.
- discarded commercial chemical products, off specification chemicals, container residues and spill cleanup residues may also be listed hazardous waste
- some of the wastes described in the preceding paragraph are considered to be "acutely toxic" and become regulated when as little as one quart is generated
- hazardous waste characteristics in general terms are as follows:
  1. ignitable wastes are liquids with a flash point below 140°F.
  2. corrosive wastes are aqueous liquids with a pH below 2 and greater than 12.5

3. reactive wastes are unstable under normal conditions and can explode or react violently with water to explode or produce toxic gases.
4. toxic wastes can leach designated contaminants when subject to the toxicity characteristic leaching procedure (TCLP), a test designed to simulate landfill conditions.

Persons who generate more than 220 pounds of hazardous waste in any one-month are regulated hazardous waste generators. Small quantity (between 220 to 2200 pounds) and large quantity (over 2200 pounds) generators must handle hazardous waste onsite or ship wastes to a permitted hazardous treatment, storage, disposal or recycling facility.

Be aware of the following:

- do not accept any waste accompanied by a hazardous waste manifest,
- Division of Waste Management field office must be notified immediately when actual or suspected hazardous waste is found during random inspections or during unloading, and
- random inspections are an important method to detect these wastes and prevent their disposal at a solid waste landfill.

**Liquids and Oils:** Liquids and oils contribute to the generation of leachate and may contain hazardous constituents that are a threat to groundwater, surface water, and human health. Some liquids may contain certain vapors which could easily ignite, or cause severe breathing issues. The best way in dealing with these types of wastes are to either recycle them or bind them with a binding agent, such as cat litter. All liquid and oil wastes must pass the paint filter test before they are disposed of in a landfill.

**Lead Acid Batteries:** Batteries contain a strong acid that could cause serious burns to the skin if operators came in contact with the liquid. They also contain high levels of lead, which can contaminate surface water or groundwater. They also become a hazardous waste when the case is broken. Lead acid batteries can be recycled and can only be accepted by a retail or wholesale seller of new lead acid batteries, a lead smelter, a recycler or collection facility delivering to a smelter or recycler.

**Whole Tires:** Effective July 15, 1992, KRS 224.50-820 required tires to be processed to prevent the entrapment of air or water before disposal in a landfill. Large off the road tires, such as the tires like the ones used on construction and mining equipment, may be placed in the bottom of a landfill cell or mining pit whole if the criteria specified in the "Notice to All Contained Landfill Owners and Waste Tire Facility Registrants Disposal Of Large Off-the-Road (OTR) Tires" dated December 15, 1999 is met.

## **Special Handling Considerations for Specific Types of Waste**

The following is an overview of how certain waste streams must be handled.

### **ASBESTOS**

- Cover immediately with 2 to 4 feet of compacted garbage.
- When covering asbestos, a sufficient cushion of garbage must be maintained between the equipment and asbestos to prevent releases to the air.
- Landfill employees must comply with OSHA standards when handling asbestos wastes.
- Other landfill users should not be allowed in an area where asbestos is being handled.
- Must be transported in approved containers (a truck is not a container) and exceptions require written approval from the Division for Air Quality.
- Containers or bags must not be ruptured during handling and compaction.
- If required by the permit, asbestos must be buried in a separate area.

### **SLUDGES**

- Must be placed in the working face and co-mixed with refuse unless an alternate method is specified in permit,
- cannot be used for daily cover, and
- can only be applied to cover soil to aid in re-vegetation if approved by permit.

### **BULKY ITEMS**

- Can lend to uneven settlement which prevents adequate runoff,
- crushing, compacting or shredding on solid ground before pushing into the working face is recommended,
- place in bottom of cell or separate area,
- objects placed in the initial lift must not be allowed to damage the bottom liner (401 KAR 48:090 section 9),
- materials for salvage or recycling may only be accumulated if a separate area away from the working face has been designated in the permit (401 KAR 48:090 section 9), and



- a chipper can be used to significantly reduce the volume of brush and the potential settlement.

### **SMOLDERING WASTE**

- empty load away from working face in the area designated in the permit (401 KAR 48:090 section 5),
- water down only as much as needed to completely extinguish as additional liquids will contribute to leachate,
- place in working face, compact and cover when no risk of fire remains, and
- exposed glass wastes have been known to start landfill fires on sunny days and should be covered with waste or soil promptly.

### **DUSTS**

- Containerization or wetting is strongly recommended to prevent a hazard to exposed persons.

### **DRUMS**

- may conceal hazardous waste or waste with free liquids,
- poor compaction may lead to uneven settlement and voids in the landfill,
- must be open for inspection to ensure regulated hazardous waste or free liquids are not contained within,
- sealed drums must not be opened or accepted for disposal by landfill personnel,
- sealed drums may contain explosive vapors, regulated hazardous waste(s), or free liquids; and
- return sealed drums to sender .

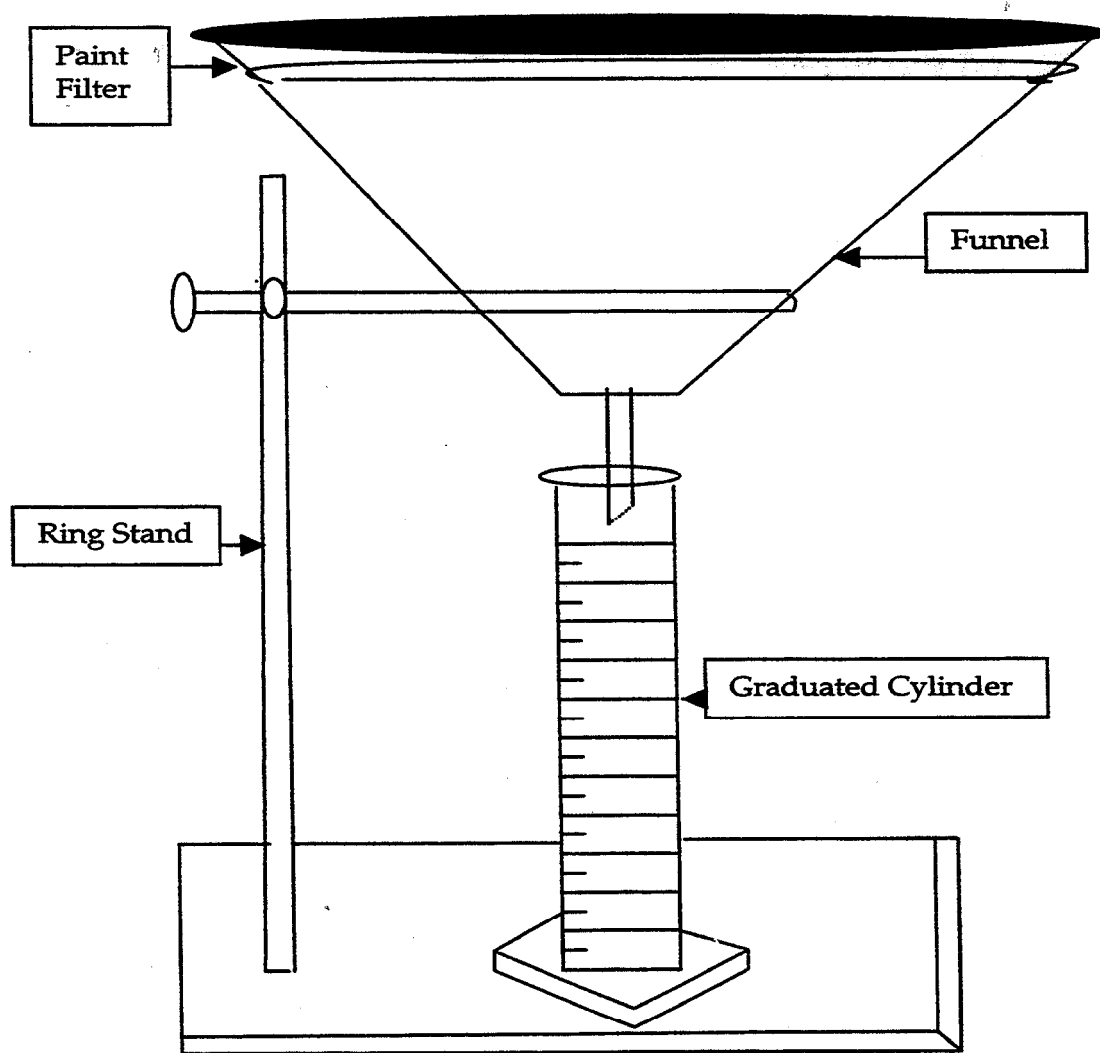
## **Waste Stream Testing**

Before you dispose of certain wastes at your landfill, it is important to find out if you can accept those wastes at your landfill. By conducting a visual inspection of the waste, you cannot always determine if that waste is acceptable. Sometimes laboratory analyses are required to determine if a waste contains leachable material or if a waste is too wet. The two tests most commonly run on waste streams are the TCLP (toxicity characteristic leaching procedure) and the Paint Filter Test.

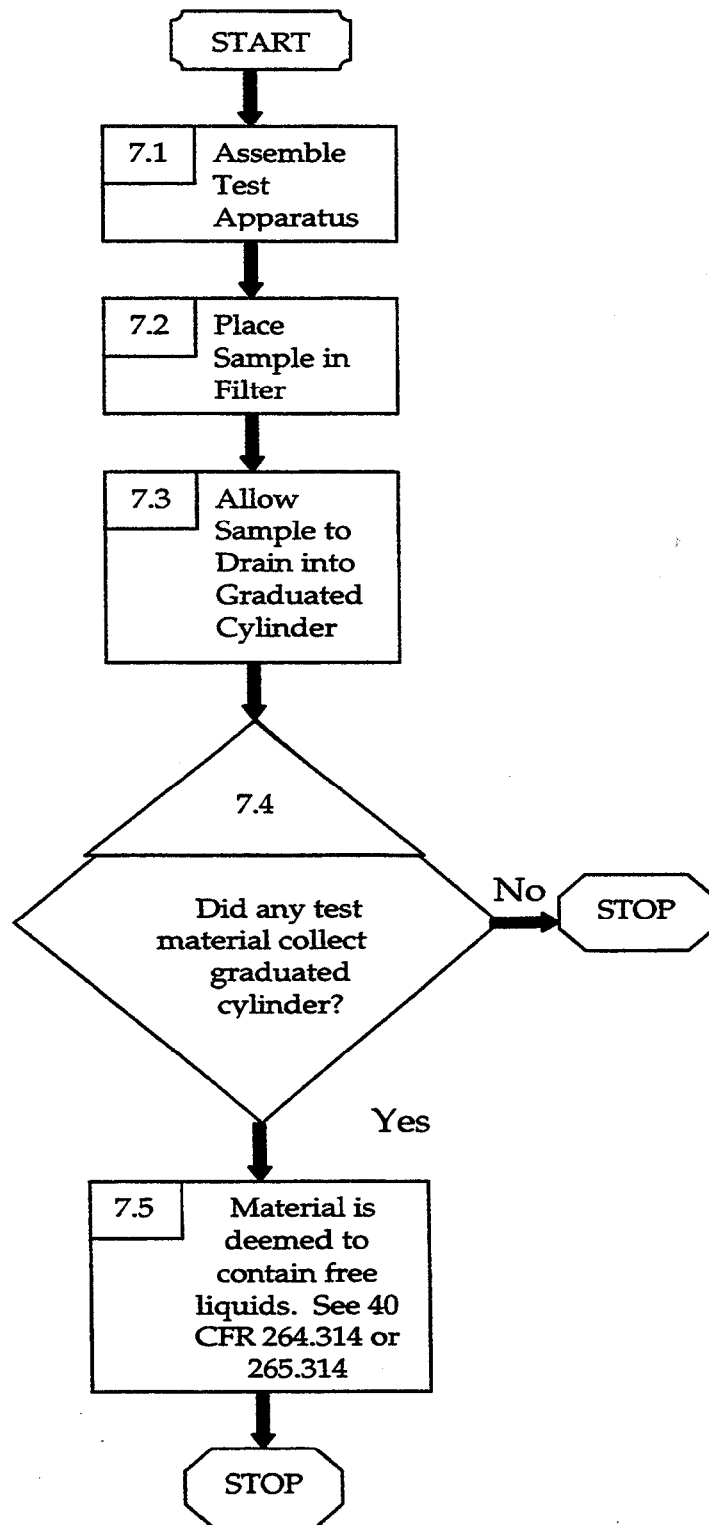
When a TCLP test is conducted, the waste stream is tested in a manner that reproduces the acidic environment of a landfill. The purpose of the test is to see how much of a particular constituent will leach out of the waste and potentially pollute the groundwater.

The paint filter test determines if a material contains free liquids. If a waste stream contains free liquids, it cannot be disposed of at a landfill. The waste must be processed or mixed with solids until it can pass the paint filter test before disposal is allowed.

**FIGURE 1 – PAINT FILTER TEST APPARATUS**



**METHOD 9095**  
**PAINT FILTER LIQUIDS TEST**





## **CHAPTER 4**

### **PERMITTING PROCESS AND GUIDLINES**

#### Chapter 4 Behavioral Objectives

1. Understand the history of solid waste management regulations.
2. Explain the purpose of the solid waste regulations.
3. List and understand the standards the permittee should be aware of when selecting a suitable site for landfill construction.
4. Know the steps in the application process.



## CHAPTER 4

### PERMITTING PROCESS AND GUIDLINES

The following section will guide you through major steps in the permitting process, and the guidelines associated with obtaining a permit. While this overview covers the main steps in the permitting process, but in order to complete the application correctly, please refer to the Kentucky Revised Statutes (KRS) Chapter 224, and the Kentucky Regulations (KAR) Chapters 30, 40, 45, 47, 48, 49.

#### The Permitting Process

This section details the history of solid waste management regulations. It also explains the permit application process for contained, construction/ demolition/debris, residual and special waste landfills. Also outlines public notice requirements and general conditions applicable to all solid waste sites or facilities.

The Division of Waste Management's developed the solid waste regulations to protect Kentucky's valuable groundwater and surface water resources.

When selecting a site suitable to build a landfill, the permittee should be aware of site selection, operational, and safety standards.

**Site Selection Standards** include:

- **Floodplain control** -A waste disposal site cannot be located in a floodway, restrict the flow of the 100 year flood, reduce the water storage capacity of the floodplain, or result in the washout of waste. A contained landfill cannot be constructed in the 100 year floodplain.
- **Water pollution control** - The site cannot contaminate ground water sources within 250 feet of the waste boundary in excess of the maximum contaminant levels identified in 401 KAR 47:030. The site may not discharge to surface waters without a KPDES permit.
- **Groundwater protection** - A facility must have more than 4 feet of compacted earth between the bottom of the landfill and the seasonal high water table or bedrock.
- **Endangered plants and animals** - A facility cannot be located where any federally protected endangered plants, fish, wildlife or their habitat would be threatened.

**Operational Standards** include:

- **Disease vector controls** - flies, rats, birds, and mosquitoes must be controlled through the application of daily cover material or other techniques.
- **Open burning** and violation of applicable air pollution requirements (KRS 224 and 401 KAR Chapters 40 to 63) are prohibited.

- Owners or operators must control litter.

**Safety Standards** include:

- Public access control,
- specified methane gas limits,
- a contingency control plan,
- required fire control,
- a communications plan,
- application of cover material

### **The Application Process**

Applications for new landfills consist of three phases - the Notice of Intent (NOI), the Administrative Application and the Technical Application. Kentucky Revised Statute (KRS) 224.40-310 and 401 KAR 47:140 Section 12 and 7(1)(a) through (d) describe the opportunities for public participation in the permitting process through oral and written comments and public hearing(s).

**Financial assurance** must be posted for closure and closure care. Bonding requirements are set forth in KRS 224.40-650 and 401 KAR 48:310 for solid waste facilities and 401 KAR 45:080 for special waste landfills.

The estimate provided for closing the facility should be calculated at the point in the active life when the extent and manner of its operation would make closure the most expensive. In addition, the cost estimate should be based on the following:

- design,
- site grading and drainage,
- hauling and placement of each element of the cap,
- final cap grading and drainage,
- re-vegetation of the cap, and
- quality control and construction certification.

This figure will be adjusted for inflation and other factors each year.

A second cost estimate will be provided, in current dollars, of the cost of hiring a third party to conduct each phase of the closure care monitoring and maintenance. This estimate can be calculated by multiplying the annual cost estimate for each phase of closure care by the number of years of closure care required. For contained landfills, the minimum estimate



accepted for closure care will be \$10,000 per year using 1990 as the baseline year. As with the closure estimate, the closure care cost estimate should be based on the most expensive costs and must be revised if changes result which increase the cost.

All applicants that obtain a permit for a solid waste site or facility must demonstrate that funds are available to them to meet the costs of closure and post closure care. For the private sector (except for waste sites which are located on property of the generator which accept industrial solid waste from the generator only), this assurance must be accomplished by posting a performance bond and one of the following:

- surety bond,
- letter of credit, or
- escrow agreement.
- trust fund
- closure insurance

Information on each of these mechanisms may be found in 401 KAR 48:310 along with the wording required for the actual agreements.

Any owner which is a city, county, urban county government, 109 district, taxing district, political subdivision of the Commonwealth, the Commonwealth or any agency thereof, or any entity whose debts and liabilities are those of the above are considered to be a publicly owned facility. Publicly owned facilities are exempt from posting a performance bond by KRS 224.43-610. However, the facility must provide a budget for the permitting, construction, operation, closure, and post closure of the facility. This budget must be revised annually. When any of the elements identified above are to be accomplished by contract or agreement, a copy of these documents must be submitted to the Cabinet.

The next thing you need to consider is the time it takes to get a construction permit, which allows you to build the landfill of your choice. Most landfill applications average eighteen to 36 months (including the time to correct any deficiencies with the application as well as hold public hearings that may be requested). It is important to remember that each site is unique. Unforeseen problems may occur that could possibly double the above estimates (a formal hearing adds 12 months).

## **STEP ONE - LOCAL DETERMINATION**

Before you may submit your permit application to the Division of Waste Management for review, you must submit your proposal to the Local Solid Waste governing body of the county in which the site is proposed. This determination ensures that the proposed facility is consistent with the county and/or area plan. The governing body has sixty calendar days from receipt of the written request to make the determination. The requirements for this determination can be found in KRS 224.40-315.

At this point, it is strongly suggested that you schedule a meeting with the Division of Waste Management to discuss the location of the site as well as discuss various other permits necessary for this project, such as KPDES discharge permits, floodplain permit, transportation permit, etc. The Division has a list of agencies and people to contact for these other permits. Division staff is also available to discuss the permitting and public notification process. To summarize, these are the steps necessary for local determination:

- Upon receipt of a written request for a local determination, the local governing body must public notice in a newspaper that a local determination has been requested. The public must be allowed input and opportunity for a public hearing. While there is not specific time period set by statute, a "reasonable" amount of time must be allowed for public input.
- Within 60 days (including the public comment period) the local governing body must submit a written determination to the Division. This determination should be based upon the data contained in the solid waste plan and should be specific.
- The Division in all likelihood will deny the permit application after the local governing body has determined the application to be inconsistent with the management plan. At this time, the county may amend their waste management plan to include the proposed facility, or the applicant may withdraw their request.

## **STEP TWO - SUBMITTING THE NOTICE OF INTENT APPLICATION**

Once you have your local determination (this determination can be either positive or negative) in hand, place the determination with the Notice of Intent Application and submit it to the Division. Requirements for the NOI application can be found in 401 KAR 47:170.

Generally, information required for the NOI application is simply a review of published information, such as general groundwater data, a soil boring and rock coring plan, threatened and endangered species data, historic places, archeological sites, etc. Once the Division accepts the application, the applicant is required to publish a notice in the local newspaper with the largest circulation in the area in which the landfill will be located. One of the most common errors found during completeness review of an application, is that an individual with signature authority for the company does not submit it. 401 KAR 47:160 section 6 describes who may submit an application. The Division has thirty working days to review the application after it is accepted. If there are deficiencies with the application, you will be notified by letter listing all of the deficiencies. Once the deficiency letter is dated and signed, the review clock is stopped until the application is resubmitted with the deficiencies corrected. The review clock is re-started at the point it was stopped (the clock does not restart at thirty working days). An important section of the application is to consider all the variances and/or alternate designs that may be necessary for your project. Siting requirements in 401 KAR 48:050 need to be closely evaluated for all new landfills.

### **STEP THREE - THE ADMINISTRATIVE APPLICATION**

The administrative application is the second phase of the permitting process. This phase contains site specific information for developing the technical design of the landfill. The application will contain information concerning groundwater flow direction, estimates on the amount of soil that is available to construct and operate the landfill, types and sources of waste to be placed in the landfill, and a conceptual design of the landfill cap and liner design. The requirements of the administrative application are found in 401 KAR 47:180. The Division has sixty working days to review the application. As with the first phase, a letter will be sent if any deficiencies are found during the review process and the clock is stopped and restarted accordingly.

Once the Division approves the administrative application, you will be asked to supply two executive summaries. One will be sent to the County Judge Executive, the other is sent to the public library in the county where the landfill will be located when the notice for the administrative application is published.

This public notice will have a thirty day comment period to allow any interested parties an opportunity to comment on the proposed landfill. This comment period will not hold up the review of the technical application once it is received. If requested, a public hearing (as described in 401 KAR 47:140 sections 7 and 12) will be held in the county where the landfill is proposed. This public hearing is better described as a meeting to exchange information concerning the proposed landfill.

If a hearing is held, a court reporter will be present to record the meeting. Copies of the transcript will be available upon request. The only charge for the copy would be the cost to the Division to reproduce it.

### **STEP FOUR - THE TECHNICAL APPLICATION**

The technical application is the last phase of the permitting process. It contains the design of the landfill cap, liner, and groundwater monitoring plan with any associated support facilities such as ponds, roads, maintenance buildings, etc. 401 KAR 47:190 contains all the requirements for the technical application.

A public notice is required to be published once the Division receives the technical application. This notice states that the technical application has been received by the Division for review. If you have the technical application prepared and ready for submittal at the end of the administrative application, this public notice can be combined with the administrative application public notice. In other words, the notice for the administrative application would read something like this "The administrative application is complete and the technical application has been received for review".

The Division has ninety (90) working days for the review of the technical application. As with the first phase, a letter will be sent if any deficiencies are found during the review process and the tolled periods are the same as in the first phase. When all the deficiencies have been

corrected and each phase of the permit application has met all the applicable regulations, the Division will issue a draft construction permit. A final public notice is then published with a thirty day (30) comment period. This notice includes an opportunity to request an adjudicatory (formal) hearing.

It usually takes the Division two weeks to issue the draft permit. During this time, the Division is working out (with the applicant) the conditions of the permit and gathering the administrative record that will be housed in the public library for the duration of the comment period.

Once the comment period expires and no comments or requests for a hearing have been received, the construction permit can be issued. It usually takes the Division two weeks to issue the permit. During this time, each phase of the application is being stamped approved and signed to go along with the permit authorizing construction of the landfill. You will need these plans to construct the landfill correctly.

Hearings requested during the technical comment period: If a hearing is requested during this period it is an adjudicatory hearing. This is an adversarial proceeding in which everyone has a lawyer. This proceeding will add eight to twelve months to the permitting process. The Division cannot issue the construction permit until the issue(s) are resolved.

## **Construction**

When it is time to build the landfill, the Division will periodically send representatives to the site to verify that construction of the landfill is the same as what is in the approved design.

Once the Division receives certification from your consulting engineer that the landfill has been built according to the approved design, the Division has ten days to issue the operating permit provided the financial assurance documents (closure and closure care bonds) are in order and have been accepted by the Division.

Once a permit has been issued, the owner must comply with the following conditions, as specified by 401 KAR 47:120, whether or not they are identified within the permit. The owner of operator must:

- comply with all conditions of the permit. Failure to do so is grounds for enforcement action,
- apply for and obtain a new permit to continue operating after the expiration date of the permit and comply with 401 KAR chapters 47 and 48 prior to operating the facility,
- in the event of noncompliance, steps must be taken to minimize releases and adverse impacts on human health and environment,

- properly operate and maintain all facilities,
- furnish information requested by the Cabinet to determine whether cause exists to modify, revoke, or terminate a permit or to determine compliance,
- allow the Cabinet or its authorized representative to enter the facility, have access to and copy records, inspect equipment, and sample and monitor to ascertain compliance,
- properly sign all applications, reports, and information submitted to the Division,
- not operate new or modified facilities until a statement is received by the engineer that the facility has been constructed or modified according to the permit; and the Cabinet has inspected the facility, and issued the permit, and
- submit monitoring reports at the specified permit or regulatory intervals and submit compliance or noncompliance reports no later than 14 days following each date in a specified compliance schedule.

In addition to the above, the owner should be aware that issuance of a permit by the Division does not convey property rights or exclusive privilege. Any permit may be revoked or modified by cause. The permit issued is not transferable to any person without prior approval of the Cabinet.

### **Transition Period**

If a residential or inert facility elected to close they did so by complying with the requirements specified below (401 KAR 47:080 section 4(4)):

- NOI was filed with the Division by November 8, 1990,
- operator maintains a valid operating permit, including bond, prior to and during closure,
- groundwater monitoring data includes the parameters identified in 401 KAR 48:300 section 11, for the respective facility category,
- operator performs corrective action provided for if required under 401 KAR 48:300, and
- a complete closure plan is filed which addresses the requirements of 401 KAR 47:080 section 5.

Residual landfills are designed and operated for disposal of specific types of waste. In view of this, specific closure designs are not identified in the regulations. The closure design

proposed for a residual landfill must assure compliance with the Environmental Performance Standards in 401 KAR 47:030 and address:

- type and amount of waste in the facility,
- mobility and expected migration rates of the waste,
- site location, topography, surrounding land use, and final site use,
- climate of area,
- characteristics of cover material,
- geologic and soil profiles,
- surface and subsurface hydrology,
- corrective action work specified by the Division,
- deed for the property must be altered to include a statement that future disturbance of the site should occur only after checking for gas or leachate migration, and
- maintenance of the site for 2 years following closure in a manner that complies with the Environmental Performance Standards and the plan approved by the Division.

As previously discussed, facilities which elected to remain open past July 1, 1992, had to file by May 8, 1991 a permit modification to outline the type of facility they wished to convert to. In the case of residential landfills, a modification to meet the transition requirements to operate as a garbage landfill July 1, 1995 or convert to >1 acre C/D/D had to be filed. The category of facility selected - contained, construction/demolition/debris, or residual landfill - determines the type of design and operational standards.

By July 1, 1992 all solid waste site facilities were required to:

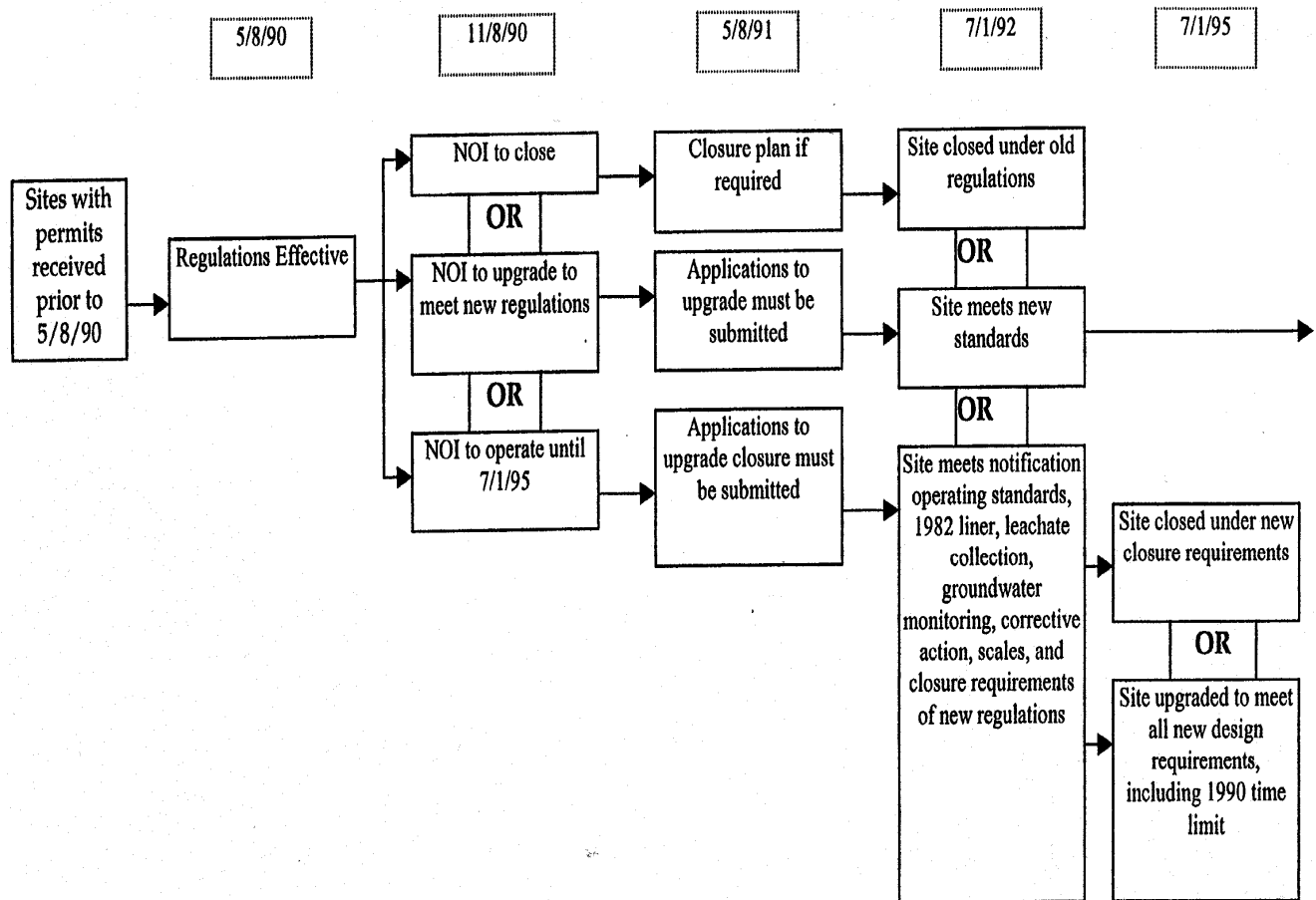
- possess a permit which complies with the standards outlined in 401 KAR chapters 47 and 48 for the specific facility,
- have complied with the requirements specified to allow MSW disposal until July 1, 1995,
- cease to take waste, or
- have an application pending with the Division for one of these options.

### **Public Information Process**

State law requires that a permit be obtained to establish, construct, operate, or maintain a waste management site or facility. Solid waste regulations provide for a 3 phase application process for solid waste landfills. It also specifies time frames by which the Division must review and take action on each phase. Differing public information requirements also exist for the application phases. The only persons not required to obtain a permit for the disposal of solid waste are:

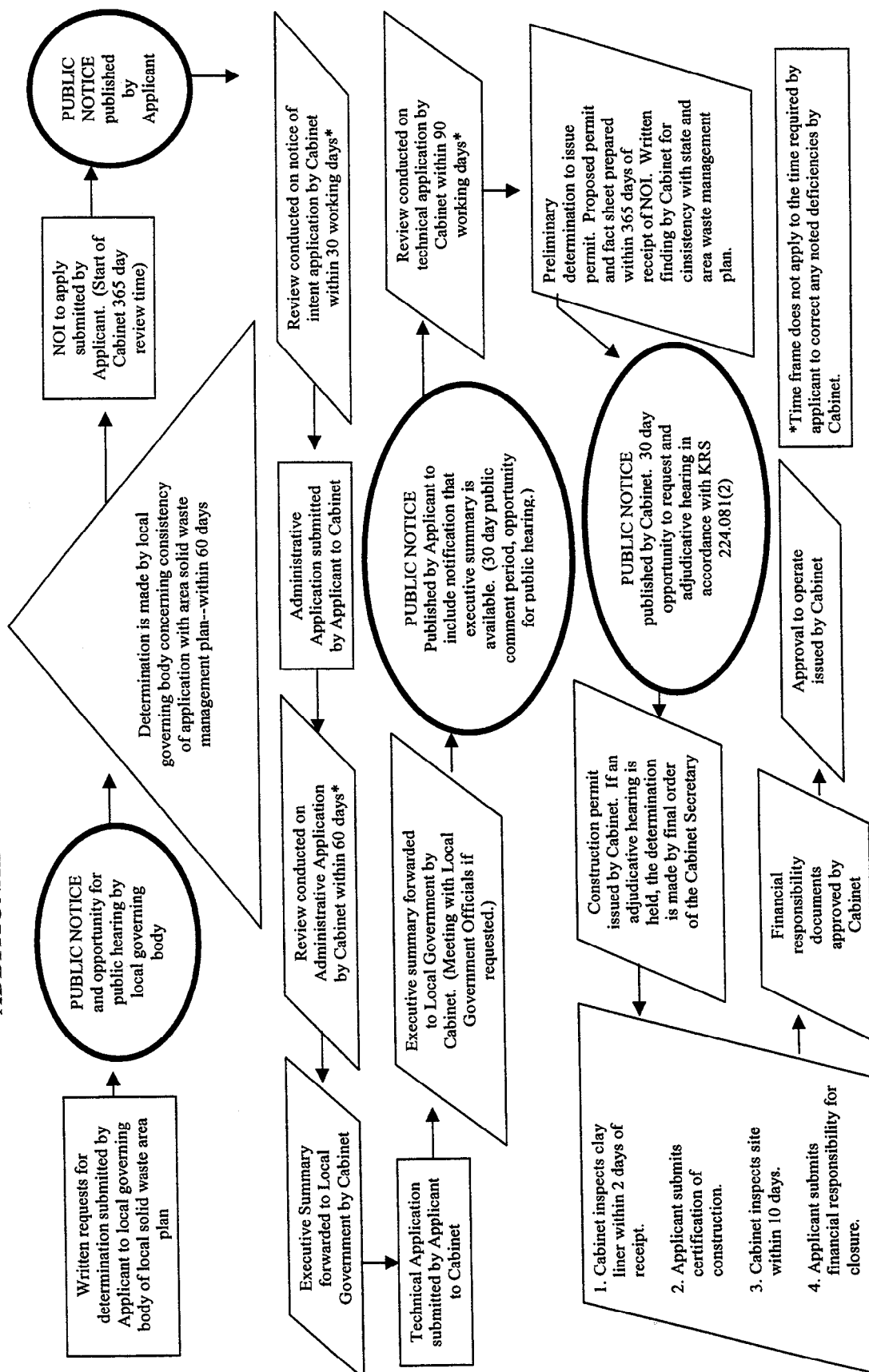
- return of agricultural wastes to the soils as conditioners,
- disposers of mining overburden, coal mining wastes, refuse, and coal mining by-products returned to the mine on the site of generation,
- owners of injection wells which have an Underground Injection Control Permit,
- users of septic tanks,
- owners of surface impoundments with Kentucky Pollutant Discharge Elimination Permits, and
- persons managing solid wastes during response to a spill of solid waste, imminent and substantial threat of a spill, or spill of material which, when spilled, becomes a solid waste.

**FIGURE 2-1**  
**TIMING OF ACTIONS DURING THE TRANSITION PERIOD**





# **LANDFILL APPLICATION PROCESS FOR NEW CONTAINED, RESIDUAL, C/D/D AND SUBSTANTIAL ADDITIONAL CAPACITY EXPANSIONS – FIGURE 2-2**





## **CHAPTER 5**

### **OPERATING YOUR LANDFILL**

#### Chapter 5 Behavioral Objectives

1. Understand the necessary activities for the scalehouse.
2. Demonstrate knowledge of the regulations related to landfills.
3. Explain what influences the size of the working face.
4. Describe the benefits of proper compaction.
5. List the methods used to obtain optimum compaction.
6. Explain the purpose of cover.
7. Explain when alternate daily cover can be used.
8. Know the important issues in operating and maintaining your landfill.
9. Understand the possible causes of leachate production and how it may be disposed.
10. List the primary end products in garbage breakdown.
11. Recognize the primary gases produced in a landfill.
12. List and explain the potential problems associated with operation.



## **CHAPTER 5**

### **OPERATING YOUR LANDFILL**

This section describes the operational requirements for all landfills as well as the purpose behind these requirements.

Operating requirements for your landfill may be found in several locations. All landfills must comply with:

- Environmental Performance Standards,
- Regulations (401 KAR Chapter 47:030 and 401 KAR Chapter 30:031), both in the general requirements and the design and operational standards for the specific category of landfill (401 KAR Chapter 47 Solid Waste & 401 KAR 45 Special Waste); and
- Conditions listed in the construction/operating permit.

The owner, certified operators, and certified landfill managers are responsible for operating the landfill in compliance with all regulatory and permit requirements. A copy of the current permit must be displayed at the site and a copy of approved plans shall be reasonably available.

#### **At the Scalehouse**

In order to determine whether your operational costs are acceptable, a common base of reference is needed. Without good records on the volume of waste disposed of at the landfill, you cannot determine cost per ton of waste. Volume data is also used to monitor the progress of filling and to project landfill space utilization.

The best data on waste volume is obtained by weighing the trucks at the landfill. This provides actual weights and records on how the waste stream varies. 401 KAR 48:070, Section 13 requires all contained landfills to install scales to measure the quantity of waste received daily. KRS 224.43 – 330(1) requires all MSW sites, including C/D/D landfills, to weigh wastes.

After the trucks are weighed, all data concerning waste volume, as well as the source of the waste from each truck, must be recorded. This information must be submitted as part of the quarterly report required by 401 KAR 47:190, Section 8.

The scalehouse operator must spot check all incoming loads for: unauthorized wastes (free liquids, etc.), and waste from unpermitted geographic sources.

## **Travelling to the Working Face**

**Posting Signs (401 KAR 48:090):** To prevent indiscriminate dumping, after working hours, landfills are required to have entrance signs posted at all public and waste hauling vehicle entrances. Information required for the sign includes landfill name, owner name, operator name, emergency phone number, and operating hours for acceptance of waste. C/D/D and contained landfills are also required to post the permit number and ensure that the sign is readable from a distance. Facility operators are required to abide by the operating hours posted on the entrance sign and have a certified operator available during these hours.

Warning signs must be posted at all access points of a contained landfill. These signs must be readable at a distance of 100 feet and should warn of site hazards (i.e., explosive gases, heavy equipment, and truck movements).

**Access (401 KAR 48:090 & 401 KAR 47:030, Section 11(3)):** Owners and operators of landfills must control public access and prevent unauthorized vehicular traffic. Both artificial and natural barriers may be used in conjunction with the following, which must be constructed and maintained at all times:

- Lockable entrance ways at all access points,
- Major access road from a publicly maintained highway to the landfill,
- Perimeter road, and
- All-weather road to within 200 feet of the working face.

The owner or operator is also responsible for removing all debris, mud and waste from vehicles before they leave the site. They are also responsible for removing any landfill debris, mud and waste from off site roadways.

Although not required by regulation, directing traffic helps prevent indiscriminate dumping away from the working face and helps prevent accidents. Traffic may be directed with barriers, signs, or a combination of both. Acceptable barriers include:

- |                   |                  |
|-------------------|------------------|
| • Fencing,        | • Rocks,         |
| • Logs,           | • Tires,         |
| • Telephone poles | • Railroad ties. |

### **Entering the Working Face Area**

All waste unloaded at a landfill must be supervised by landfill personnel. The purpose of this is to:

- prevent accidents,
- prevent unauthorized scavenging,
- ensure detection of problem or unauthorized wastes; and
- prevent unloading at a rate that exceeds the capacity of on-site equipment used for compaction and cover placement.

Supervision also allows vehicles to be unloaded in specified areas. Since it takes more time for a vehicle to be unloaded manually, an improperly positioned vehicle could slow down the number of vehicles able to unload at a busy site or time.

Whether vehicles unload at the top or bottom of the working face will generally be determined by the design of the site. Dumping at the base of the operating face and pushing wastes up is preferred because:

- equipment can operate more efficiently and obtain maximum compaction rates,
- it is easier to control the size of the working face, and
- blowing litter is minimized.

### **The Working Face**

The exact size of the working face is not specified by regulation, however, contained landfills are required (401 KAR 48:090, Section 9) to confine dumping to the smallest practical area. Some permits may designate specific dimensions; however, a general rule of thumb is to allow approximately 2 blade widths per piece of equipment operating. The size will be influenced by:

- quantity of waste received,
- number of pieces of equipment operating,
- approved plan, and
- Advantages of a small working face include:
  - ✓ minimizes exposure to wind and rain,
  - ✓ **less** cover material is needed at the end of the working day; and
  - ✓ lower equipment operating costs.

**Compaction** is an extremely important factor in reducing many of the problems associated with landfill operation. Benefits include:

- less cover is used since large voids (or holes) in the garbage will be eliminated,
- air space is conserved, since more waste can be placed in a smaller area,
- amount of eventual settling in filled areas will be reduced,
- amount of blowing litter is reduced,
- runoff of surface waters is promoted; and
- creates a less permeable fill by reducing the amount of rainfall entering the landfill and reducing the potential for leachate (a liquid containing decomposed waste, bacteria, and other dangerous materials) generation.

Optimum compaction (i.e., maximum practical density) can be obtained through use of the following methods.

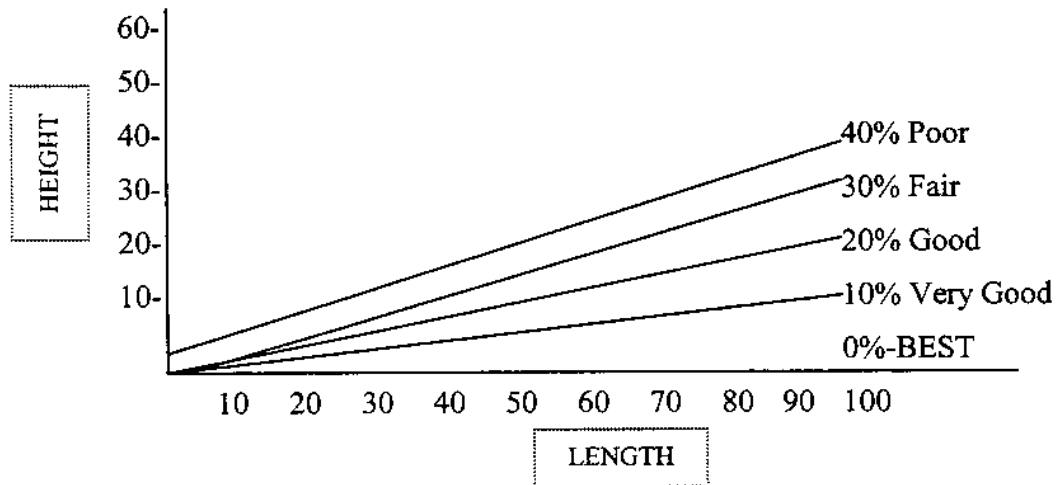
**Compaction Rate:** Maximizing the waste compaction rate for the site is one of the most important aspects of landfill operation. For example, the difference between 1,100 to 1,200 lbs/cu yd of garbage density over a 1,000,000 cu yd site which has a \$25 per ton tipping fee results in an additional gross profit of \$1.25 million without construction of additional airspace. Another way to look at the savings is at 500 tons per day of incoming wastes, a four month postponement for construction of the next cell.

**Equipment:** Use appropriate equipment for the type, size and volume of waste received and soil to be moved. For specific information on determining the type and size most suitable for your landfill, consult equipment dealers. Guidelines for selecting equipment can be found in the Equipment chapter.

**Slope:** Track type equipment works more efficiently when wastes are pushed uphill on a 3:1 slope. This allows the weight of the equipment to be concentrated over a smaller track surface area. The design of a compactor allows the most efficient compaction to occur on flat ground since the weight is already concentrated over a small area. A comparison of the effects of slope on compaction with a compactor can be found in FIGURE 6-1.



**FIGURE 6-1**  
**SLOPE vs Compaction**



**Shallow Layers:** Waste should be compacted in layers no more than 2 feet thick to reduce the effects of cushioning. As wastes are being pushed, lifting the dozer blade 2 to 3 feet off the ground can spread large piles of wastes. A lift height of 8 feet for construction/demolition/debris landfills or the height specified in the contained landfill permit must not be exceeded. A comparison of the effect of lift thickness on compaction density is shown in Figure 6.2.

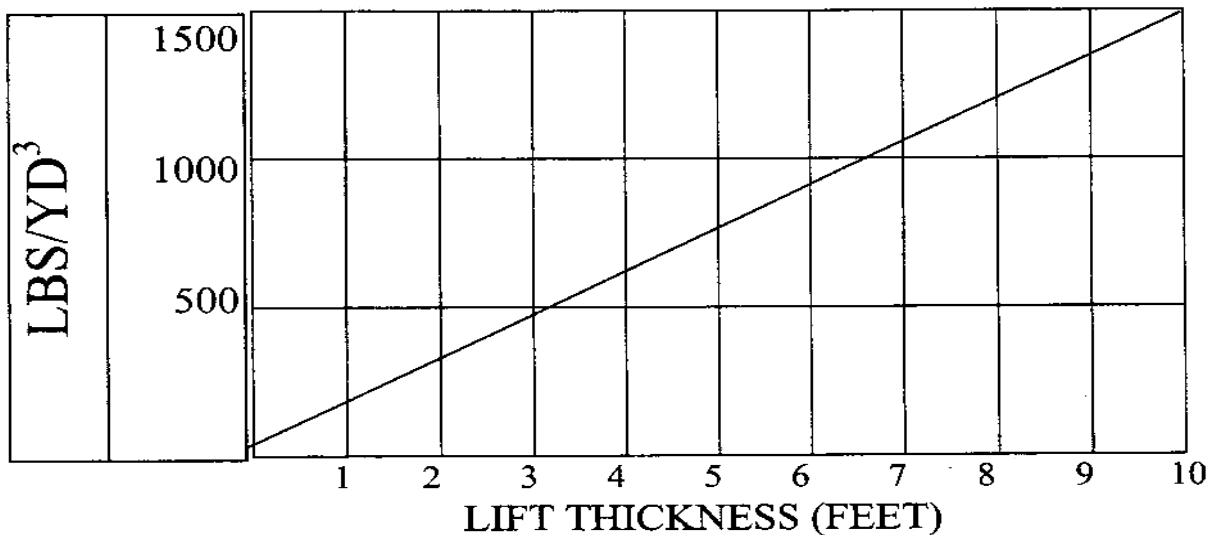
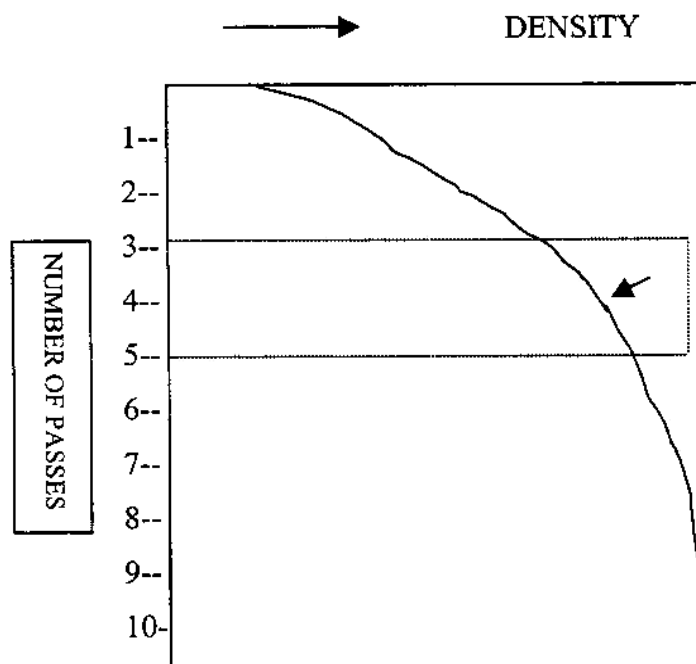


Figure 6.2 - Compacted Waste Density versus Lift Thickness

**Passes** - Optimum compaction is obtained by running over waste 3 to 5 times. You can see in FIGURE 6.3, less than 3 passes results in poor compaction. Densities do not increase after 5 passes. Operators of contained landfills are required to ensure that the entire waste surface is passed over 4 times. More information on equipment passes will be discussed in the Equipment Section.



**FIGURE 6-3**

**401 KAR 48:090, Section 9** requires contained landfills to have sufficient equipment available to spread and compact all waste within 2 hours of receipt. Waste should be spread in layers not exceeding 24 inches in depth. Contained landfills should strive for an in-place waste density of 1,200 pounds per cubic yard in a completed cell. Steel wheel compactors with a minimum gross ground pressure of 325 pounds per linear inch of wheel width, a gross weight of 30,000 pounds and 130 horsepower engine are suggested to accomplish this. Backup equipment must be available within 24 hours of breakdown.

**Cover:** Daily or weekly cover consists of soil, properly weathered or crushed shale, siltstone, or other materials pre-approved by the Cabinet. The purpose of cover is to:

- Reduce vectors - Fly eggs cannot emerge through 6 inches of soil. This also reduces the attractiveness for rats and birds.
- Litter control - No waste is exposed after operating hours.

- Fire control - Glass left exposed to the sun can ignite other wastes. Daily cover also controls atmospheric oxygen and provides a fire barrier between cells.
- Reduce odors
- Promotes runoff - Reduces infiltration of surface water that produces leachate.
- Provides a medium for vegetative growth.
- Controls the movement of leachate and gases.

Soils or other weathered/earthen materials that have been contaminated with petroleum may be used as daily cover if the maximum benzene concentration of the material is less than or equal to 1.0 ppm and the material is not placed as daily cover during a precipitation event.

Alternate daily cover can be used if approved by the Cabinet in advance. Different types of alternate daily cover include:

- Tarps (Belton),
- Posi-Shell

**NOTE: Alternate daily cover may not be used unless the Cabinet has granted prior approval.**

**Litter** is a common problem at many contained landfills. Because waste is required to be covered on a daily basis (every 24 hours), there is a strong potential for waste to blow from the working face to other areas of the landfill. Litter can be controlled with litter fences or netting, but all litter attributable to the site's operation must be picked up within 48 hours per 401 KAR 48:090, Section 9. The area around the landfill must be policed on a regular basis to collect scattered material.

**Surface water control** is an important factor in maintaining your landfill. If not controlled, excessive amounts of rainfall and other precipitation will soak into the fill and produce leachate. The following methods are used to control surface water:

**Prevent run-on** - Surface water can be directed away from fill areas through the use of diversion ditches and berms. These structures must be shown on the engineering plans, and must be constructed.

**Promote runoff** - The entire site, including the area of the landfill being actively worked, shall be graded as necessary to drain rain water from the fill area and to prevent standing water. Smoothly graded and crowned cover will allow water to runoff quicker and reduce the amount of water seeping into the fill.

Landfills are designed for surface water control based on the topography at a particular site. Therefore, it is important to use features (i.e., sediment structure, run-on/runoff ditches, grading) as designated in approved plans for that site.

Uncontrolled surface water can also cause erosion. Discharge of sediment or fill material into the waters of the Commonwealth is prohibited under the Environmental Performance Standards in 401 KAR 47:030.

Methods used to control erosion include the following:

- vegetation - required for interim, long-term, and final cover,
- constructing permanent or temporary berms - recommended on steep slopes or slopes longer than 50 feet and may be constructed of earth or straw bales,
- constructing permanent or temporary diversion ditches, and/or
- operating equipment so track prints are perpendicular to the slope.

When erosion occurs, additional cover must be added and areas graded to maintain the required depth of cover.

**Leachate Control:** Normally leachate can be controlled through the following good management practices:

- prohibiting the disposal of free liquids (401 KAR 48:060, Section 2(3), and 48:090, Section 8),
- maintaining a small working face and obtaining optimum compaction,
- using adequate cover on all areas,
- maintaining proper surface water control, and
- controlling erosion.

When leachate is observed, you should determine if the above practices are being followed. When problems are found, they should be corrected as soon as possible. The following may lead to production of leachate:

- moisture content of the waste - watch for liquid draining from trucks,
- a large working face and poor compaction,
- lack of adequate cover - use backhoe, dozer, or post hole digger to determine,
- poor grading or waste settling - check for standing water after rain,

- improperly functioning diversion ditches, and
- erosion ditches or gullies.

Small leachate outbreaks can sometimes be corrected by covering them with soil particularly if the source is identified and eliminated. However, if leachate cannot be controlled and is allowed to enter the waters of the Commonwealth, you will be operating in violation of the Clean Water Act.

At one time it was a common practice to build ponds to collect leachate. Ponds also collect large volumes of surface water and have the potential to overflow during heavy rains. Most collection systems are now designed for placement under fill areas, or along the toe of the fill, so that they are not exposed to surface water runoff. Leachate is then collected in tanks for disposal. Design requirements for leachate collection systems are discussed later in this manual.

To maintain a leachate collection system that will function, it is important to remember:

- geosynthetic filter fabric or other suitable material must be placed above the drainage layer to prevent clogging,
- proper construction of leachate lines is extremely critical in keeping the system draining properly and preventing clogging,
- pipes should have a minimum of 1 percent slope,
- the system should be designed to allow internal inspection, cleaning, and maintenance, and
- leachate must be pumped on a periodic basis to prevent overflow and clogging of collection lines.

Leachate may be disposed of by:

- discharging into sanitary sewers or wastewater treatment plant with prior approval,
- returning it to completed waste cells, if previously approved by the Cabinet, and
- properly treating it in a permitted onsite wastewater treatment plant.

The technical phase of the application includes a description of how leachate will be disposed of. The method of disposal selected must be utilized and proper approvals/permits obtained.

**Landfill Gas Control:** When waste in the landfill decomposes, landfill gas can be generated. Wastes are decomposed both through chemical reactions with landfill liquids and the action of

bacteria and other microbes that occur naturally in the environment. Organisms feed on organic materials found in garbage breaking them down into end products consisting primarily of:

CO <sub>2</sub> (Carbon Dioxide)
CH <sub>4</sub> (Methane)
H <sub>2</sub> O (water)
NH <sub>3</sub> (ammonia)
Humus

Complete decomposition may take 50 years or more. However, conditions are such that rapid decomposition occurs mainly within the first 5 years. Landfill gas is composed primarily of by-products of microbial reactions in the landfill. Initially, solid waste decomposes aerobically (with oxygen). The primary gas product is carbon dioxide. As the oxygen is used up, anaerobic (without oxygen) microorganisms become more active. These bacteria continue to produce carbon dioxide, but the process proceeds into second-stage anaerobic decomposition, where both methane and carbon dioxide are produced at approximately a 50 to 50 ratio. Other compounds are also produced by volatilization.

Landfill gases produced in the most significant quantities are:

- **Carbon dioxide**, which is highly soluble in water, forms carbonic acid, dissolves iron from metal cans and lime from materials containing calcium, increases the hardness of water (including groundwater) and is odorless and colorless.
- **Methane** is also produced. Methane travels upward through the waste or along the path of least resistance into the atmosphere, pipes, or buildings, and is not very soluble in water, explosive, odorless, colorless, and tasteless.
- **Hydrogen Sulfide** creates odors (rotten egg) and a foul taste when dissolved in water and in the presence of dissolved oxygen in the water; sulfide will be oxidized to tasteless and odorless sulfur and sulfates.

Because methane gas is so dangerous, landfills are required to monitor for its presence. Alarms must be installed in every building onsite to monitor for methane gas. 401 KAR 48:090, Section 4 requires the owner or operator to monitor for explosive gas quarterly at the following locations:

- underneath or in the low area of each onsite building,
- at locations along the boundary as shown in the permit,
- at each passive gas vent installed under the final closure cap,
- at any potential gas problem areas, as revealed by dead vegetation or other indicators, and

- at any other points required by the permit.

It is necessary to control gas production to prevent the gas from damaging vegetation and endangering human health. To control landfill gas, must install at least one of the following:

- passive gas vents, or
- gas recovery wells (flares).

### **Potential Problems Associated with Operation**

**Litter:** Environmental Performance Standards found in 401 KAR 47:030, as well as landfill operating requirements, prohibit the grounds in and around the landfill from becoming a nuisance due to litter. Interior fences may be required to prevent litter from blowing from the landfill. The permitted area shall be policed on a routine basis to collect all scattered material. Litter can be controlled through the following practices:

- good compaction makes it more difficult for wind to scatter refuse,
- install litter fences placed downwind of the unloading area,
- require trucks to be covered,
- adequate placement of daily cover, and
- when practical, design and construct trenches perpendicular to prevailing winds.

**Fires:** Environmental Performance Standards prohibit open burning of solid or hazardous wastes and/or violations of applicable air quality standards. While prohibited, fires do occur. Fires can be caused by:

- equipment fires,
- burning adjacent to fill areas,
- smoldering refuse, and
- glass wastes exposed to bright sunlight.

Prevent and control fires by:

- carrying fire extinguishers on all landfill equipment,
- do not burn near fill areas if this method must be used for land clearing,
- dump any smoldering wastes away from fill areas (401 KAR 48:060, Section 2(2), and 48:090, Section 5), and

- cover glass wastes immediately.

If a fire breaks out call the fire department immediately. To control the spread of an underground landfill fire, the area surrounding the fire should be saturated before applying water to the fire itself. Smoldering wastes should then be carefully excavated and completely cooled before they are returned to the fill.

A fire safety and response plan must be developed and maintained per 401 KAR 48:070, Section 12(4). The plan should include a topographic map showing the exact location of the landfill, a site map and an emergency contact, indicate the location of additional fire fighting water sources, all roads and major site features. Additionally, it should address how to reduce the risk of fire, identify all onsite equipment, and list the procedures to follow when responding to a fire. A copy of this should be delivered or mailed to the local fire department.

**Vectors:** Insects or animals that carry disease-producing organisms are known as vectors. Common vectors include:

- |         |              |
|---------|--------------|
| • flies | • mosquitoes |
| • rats  | • dogs       |
| • birds | • cats       |

Large flocks of birds attracted by a landfill can also create a hazard to aircraft. This is why new contained landfills are not be allowed to be sited within 5,000 feet of any airport runway used by piston-type aircraft or 10,000 feet of any airport used by turbo-jet aircraft. In certain cases, it is possible for the Cabinet and the Federal Aviation Administration to grant a variance.

Adequate cover, which eliminates both food and shelter, is normally adequate to control vectors. However, the Division may require other control measures when necessary. The local health department may be a useful source of information and assistance on vector controls.

**Inclement Weather:** The following practices will help reduce the severity of problems associated with wet and extremely hot or cold working conditions.

- maintain at least a 3 day stockpile of cover material near the working face. More, if cover must be hauled a long distance,
- construct stock piles to promote runoff,
- drain surface water away from the working face,
- when needed, place a designated wet weather working area near the entrance and make sure adequate cover is readily available,
- construct all-weather roads,



- maintain a stockpile of gravel for use on roads,
- provide a heated equipment shed,
- maintain equipment in accordance with manufacturers recommendations, and
- on days that freeze and thaw, obtain cover early in the day before it has a chance to thaw.

**Dust** on haul roads and other areas of the landfill must be controlled to prevent a nuisance or violations of air quality standards. Water trucks may be used to reduce dust. However, used oil must not be used.

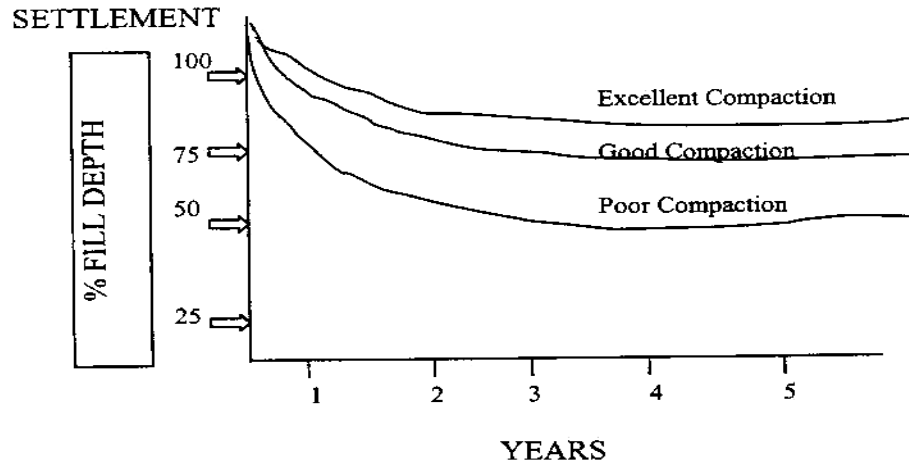
**Land Settlement:** The amount of settlement that will occur is dependent on several factors:

- type of refuse,
- depth of refuse,
- amount of compaction,
- rate of decomposition, and
- moisture content.

There are 2 types of settlement - subsidence and differential. **Subsidence Settlement** is a uniform settlement or sinking of the entire fill that occurs slowly over time. Subsidence settlement is caused by:

- weight of fill (related to height),
- decomposition of waste resulting in less volume, and
- poor compaction.

Control of settlement is accomplished by maximum compaction, final grade design, and refilling settled areas. The following figure shows fill settlement over time based on compaction.



**Differential Settlement** is a non-uniform settlement of selective filled areas. These areas may be large or small in size and occur randomly throughout time. Differential settlement is caused by:

- traffic
- poor compaction,
- uneven filling
- highly organic waste placed next to inorganic or inert waste,
- shifting of materials once decomposition occurs.

Problems created by differential settlement include:

- allowing water to enter the fill through ponding,
- increased leachate generation,
- reduction of vegetative growth, and
- restriction of the completed site use for surface and subsurface structures

Damages to rigid structures not designed to withstand differential settlement are common, and flexible pavements invariably fail when subjected to sub-grade settlement. How do you control differential settlement?

- build roadways up with inert materials
- grade surface areas to promote runoff
- employ principles of good compaction that include:
  - ✓ 3:1 slope on working face
  - ✓ 3 to 5 passes for maximum compaction
  - ✓ spreading in maximum 2 foot layers

- ✓ push C/D/D waste up slope
- ✓ separate bulky wastes; compact inorganic waste tightly around bulky waste
- ✓ compact bulky wastes as much as possible prior to placing in fill
- ✓ keep working area smooth and uniform
- ✓ fill depressions with clean fill (dirt) as they become evident and grade to promote runoff.

Settlement has occurred when any of the following conditions are noticeable:

- standing water
- visible holes
- cracks in cover
- creation of high water lines
- ponding
- depressions
- flat slopes



## **CHAPTER 6**

### **MONITORING YOUR LANDFILL**

#### Chapter 6 Behavioral Objectives

1. Understand 401 KAR 47:120 Section 1(1) as it relates to landfill plans.
2. Explain the importance of engineering plan sheets.
3. Understand the Environmental Performance Standards.
4. Explain the purpose and the requirements of surface water and groundwater monitoring.
5. Know the importance of proper sampling and the considerations that should be given to surface water and groundwater.
6. Understand the requirements for data submittal.
7. Identify the type(s) of equipment used to test for explosive gases.
8. Understand the importance of recordkeeping.
9. Understand the purpose of the annual volume survey.



## **CHAPTER 6**

### **MONITORING YOUR LANDFILL**

This section discusses the monitoring procedures associated with each type of landfill, with emphasis on groundwater and surface water monitoring.

#### **General Understanding of Landfill Plans**

Under 401 KAR 47:120 Section 1(1), the permittee has the responsibility to follow all approved applications. The approved applications include engineering plans, which are scaled drawings that show existing and proposed conditions. In order to comply with the applications, the permittee should carefully read the engineering drawings and check the site elevation and grade.

Maintaining proper elevations is the key to following engineering plan sheets. To do this, existing elevations and proposed cut or fill elevations must be determined based on the plans. The following items are essential to following plans.

- Permanent grade stakes/elevations markers are necessary to use as a reference point. These could be monuments or lag screws in a tree, utility pole or on a building. Do not use items that may be moved during construction of the fill such as fence posts, road, etc.
- Temporary grade stakes can be placed in areas where filling is occurring to obtain slopes and elevations.
- Grade must be checked against plans periodically.
- Obtaining an overall site plan elevation is best accomplished by using an Operational Plan to show how to achieve the final product. The site manager, operator and engineer must discuss drainage operation and traffic flow for each phase.

#### **Environmental Monitoring**

All waste sites or facilities must comply fully with the Environmental Performance Standards (EPS) in 401 KAR 47:030 (for solid waste sites) or 401 KAR 30:031 (for special waste sites). There are no exceptions to this requirement, because the cabinet is prohibited by from issuing variances to the EPS by 401 KAR 30:020 Section 2.

The Environmental Performance Standards include, in part, provisions that: 1) pollutants shall not be discharged into the surface waters of the Commonwealth; 2) groundwater shall not be contaminated beyond a point of compliance for the facility in excess of the maximum

contaminant levels (MCLs) specified in 401 KAR 30:031 (for special waste sites) or 401 KAR 47:030 (for solid waste sites), or statistically elevated concentrations of parameters that lack MCLs; and 3) the concentrations of explosive gas in facility structures shall not exceed 25% of the lower explosive limit (LEL) for methane, and shall not exceed 100% of the LEL for methane at the property line of the facility.

Surface water, groundwater, and methane monitoring plans are included in the permit applications for special waste, residual, construction/demolition/debris and contained landfills, and each facility must be monitored in accordance with the approved plans and the permit. The Division reviews the data submitted in the environmental compliance monitoring reports to determine whether the facility is in compliance with the Environmental Performance Standards.

### **Surface Water Monitoring**

Surface water sampling under solid waste and special waste permits allows for verification that leachate is not entering the surface water and that facility operations are not otherwise adversely impacting surface water. Surface water monitoring points must be located to characterize the quality of water unaffected by the landfill and water that leaves the landfill in surface drainage. In selecting monitoring locations, one site should be identified, upstream from the landfill or outside of the effects of waste placement, for use in background comparisons. Downgradient monitoring points should be located on the inlet side of the surface water sediment structures, in the landfills surface water runoff ditches to monitor the landfill runoff water before it enters the sediment ponds. The upgradient point selected may be a surface stream.

An analysis shall be conducted for the following parameters by collecting grab samples, at previously specified points as approved by the Division, on a quarterly basis.

#### **Quarterly Monitoring checks for:**

- Chlorides,
- Sodium,
- Sulfate,
- Total organic carbon (TOC) or biochemical oxygen demand (BOD),
- Iron,
- Specific conductance,
- pH, and
- Solids (total suspended solids, total dissolved solids and total solids) chemical oxygen demand.



All facilities with storm water runoff structures and point source discharges are required to have a KPDES from the Division of Water. Documentation will be required during the Division of Waste Management permit review process that this application has been submitted.

### **Groundwater Monitoring**

The groundwater monitoring system approved within the application is meant to allow an accurate assessment of the groundwater quality and characterize groundwater flow and flow systems. Residual, CDD, and Contained Landfills must have at least one background well hydraulically upgradient from the disposal area and at least 3 downgradient monitoring wells with the Division's approval. Special Waste Landfills must include at least one background well hydraulically upgradient from the disposal area and at least 2 downgradient monitoring wells with the Division's approval. The Division may approve springs in addition to or instead of downgradient wells. An alternate monitoring plan may be used if approved by the Division.

A groundwater characterization as required in 401 KAR 47:180 shall contain the chemical characteristics of the upper most aquifer down to and including the lowest aquifer that may be affected by the site or facility. This description shall include results of analysis of at least two (2) samples of groundwater from the site before waste placement for the parameters listed in 401 KAR 48:300, Section 10. Special Waste Landfills must perform groundwater characterization according to 401 KAR 45:160.

Groundwater sampling intervals and parameters differ for each type of solid or special waste site or facility. Residual landfills monitor quarterly for parameters determined by the Division based upon the chemical analysis of the waste to be disposed (401 KAR 48:300 section 11(4)).

<b>C/D/D LANDFILLS MONITOR SEMI-ANNUALLY FOR:</b>	
Chloride	Arsenic
Chemical Oxygen Demand (COD)	Barium
Total Dissolved Solids (TDS)	Cadmium
Total Organic Carbon	Chromium
Specific Conductance	Lead
pH	Mercury
Iron	Nitrate
Sodium	Selenium
Groundwater Elevations	Temperature

If after four consecutive monitoring periods, analysis of the required parameters indicates no exceedences of the MCL's, the owner or operator may request to reduce the monitoring parameters to those listed in 401 KAR 48:300 section 11(2)(a). Other parameters may be added to the permit as required to ensure protection of human health and the environment.

<b>SPECIAL WASTE LANDFILLS MONITOR SEMI-ANNUALLY FOR:</b>	
Chloride	Chemical Oxygen Demand (COD)
Total Dissolved Solids (TDS)	Total Organic Carbon
Specific Conductance	pH
Copper	Groundwater Elevation

If after four initial monitoring events, analysis for the required parameters indicates no exceedences above levels the MCL's as specified in 401 KAR 30:031 or significant increases over established background levels for parameters that have no MCL, the owner or operator may request to reduce the monitoring parameters to those listed in 401 KAR 45:160 section 8(2)(a). Other parameters may be added to the permit as required to ensure protection of human health and the environment.

<b>CONTAINED LANDFILLS MONITOR QUARTERLY FOR:</b>	
Arsenic	Silver
Antimony	Sodium
Barium	Thallium
Beryllium	Vanadium
Cadmium	Zinc
Chromium	Temperature
Cobalt	Chloride
Copper	Chemical Oxygen Demand (COD)
Iron	Total Dissolved Solids (TDS)
Lead	Total Organic Carbon
Mercury	Specific Conductance
Nickel	pH
Nitrate	Total Organic Halides
Selenium	Acetone
Acrolein	Acrylonitrile
Benzene	Bromochloromethane
Bromodichloromethane	Bromoform
Bromomethane	2-Butanone
Carbon Disulfide	Carbon Tetrachloride
Chlorobenzene	Chlorodibromomethane
Chloroethane	Chloroform
Chloromethane	Dibromomethane
1,2-Dibromo-3-chloro-propane	1,2-Dibromomethane
1,2-Dichlorobenzene	1,4-Dichlorobenzene
Trans-1,4-dichloro-2-butene	1,1-Dichloroethane
1,2-Dichloroethane	Cis-1,3-dichloropropene
Trans-1,3-dichloropropene	Ethylbenzene
2-Hexanone	Iodomethane
Methylene Chloride	4-Methyl-2-pentanone
1,1-Dichloroethene	Cis-1,2-dichloroethene
Trans-1,2-dichloroethene	1,2-Dichloropropane
Styrene	1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane	Tetrachloroethylene
Toluene	1,1,1-Trichloroethane
1,1,2-Trichloroethane	Trichloroethene
Trichlorofluoromethane	1,2,3-Trichloropropane
Vinyl Acetate	Vinyl Chloride
Xylene	Groundwater Elevations
Rate and Direction of Groundwater Flow	

If after four consecutive monitoring periods, analysis of the required parameters indicates no exceedences of the MCL's, the owner or operator may request to reduce the monitoring parameters in accordance with 401 KAR 48:300 Section 11(3)(f). Other parameters may be added to the permit as required to ensure protection of human health and the environment.

The analytical methods used by the laboratory must be consistent with those outlined in USEPA SW-846 or other approved methods. SW-846 is a manual consisting of lab methods and procedures necessary to correctly analyze a sample. The permittee must also ensure that the laboratory method for each parameter is sufficiently accurate to determine compliance (i.e., the method detection limit must be below the MCL for that parameter).

If an MCL or background concentration has been exceeded by one or more parameters, and this exceedence has been verified by confirmation sampling, a groundwater assessment plan must be prepared and submitted within 30 days of the occurrence. Contents of the plan and confirmation sampling procedures are outlined in 401 KAR 48:300, Section 8.

### **Data Submittal**

All lab results must be submitted, within 60 days of the sampling event or 15 days after receipt of the statistical analysis – whichever is sooner. The statistical analysis must be performed separately for each parameter in Section 11, for each sampling event, and for each well to determine if there has been a significant increase over background values for each parameter that lacks an MCL. This information must be submitted in duplicate to the Solid Waste Branch, Division of Waste Management, 200 Fair Oaks Lane, Frankfort, Kentucky 40601. If laboratory delays are encountered, a letter requesting an extension of the 30 day period must be sent to the Solid Waste Branch, Permit Review Section.

If sample results indicate contamination, the owner or operator must notify the Division within 48 hours of analysis receipt and arrange to split confirmation samples within 10 days of analysis receipt. If it is determined that a drinking water supply has been affected, and that the probable source of the contamination is the landfill, the facility shall provide alternate drinking water supplies to all affected parties within 24 hours of the notification of the Division. If the confirmation sampling verifies that an exceedence has occurred, the landfill must prepare a groundwater assessment plan, and submit it to the Division within 30 days. The assessment plan must specify the way in which the landfill intends to determine the existence, quality, quantity, areal extent, and depth of groundwater degradation, and the rate and direction of migration of contaminants in the groundwater. The assessment plan must be implemented within 60 days of its approval by the Division. If the Division determines that the assessment plan is inadequate, it can either issue a Notice of Deficiency (NOD) or modify the plan and approve it as modified. The Division may require abatement measures prior to the approval of the assessment plan.

Within 90 days of the implementation of the assessment plan, the landfill must submit an assessment report that gives a summary of the data collected in the assessment investigation, an analysis of the data, and recommendations on the necessity of abatement. Within 120 days of the approval of the assessment report, the landfill must submit a corrective action plan that specifies:

- 1) The methods that will be used to abate the groundwater contamination;
- 2) The actions that will prevent further releases from the facility;
- 3) The process by which affected water supplies will be restored or replaced; and
- 4) Any other measures necessary to protect human health and environment.

Corrective action must be performed as necessary to comply with 401 KAR 30:031. The requirements for groundwater monitoring, assessment and corrective action can be illustrated by the following schedule.

#### **GROUNDWATER MONITORING, ASSESSMENT/CORRECTIVE ACTION SCHEDULE**

Day	Activity To Be Accomplished (if required)	48:300 Reference
--	Samples are obtained from well	Section 7(1)
0	Analysis received within 60 days of sampling (maximum)	Section 7(2)
2	If contamination is detected, special notice must be given to Division	Section 7(3)
3	Owner or operator provides drinking water to affected parties	Section 8(3)
10	Confirmation sampling	Section 7(3)
30	Assessment Monitoring Plan due to Division	Section 8(4)
77	Division review/approval due	Section 8(4)(a)
137	60 days for owner or operator to implement assessment plan	Section 8(4)(a)
227	90 days to submit Assessment Report to the Cabinet	Section 8(7)
275	Division review of Assessment Report	
365	Submit Corrective Action Plan within 90 days of Assessment Report approval, but no later than 1 year from date of original analysis	Section 8(9)

### **Sample Collection**

All landfills that are required to monitor groundwater and surface water must have samples collected using proper and approved collection procedures. This cannot be overemphasized as the end goal is the collection of a representative sample(s). The following checklists are included as an aid for the landfill manager to ensure proper collection techniques are being followed.

### **General Sampling Considerations**

- Always wear clean, chemically inert latex or plastic disposable gloves when taking samples. Change them each time a new sample is taken.

- Always clean the sample equipment before and after sample collection, unless the equipment is chemically inert and pre-cleaned. Distilled water and an approved non-phosphatic detergent may be employed if necessary.
- NEW sample containers must be used to collect samples.
- Use the proper container types (Teflon, glass, stainless steel, or plastic) for the analysis to be conducted.
- Avoid contaminating the inside of the sample bottle when removing the cap.
- Do not place anything other than the sample itself and the proper preservatives into a sample container.
- Collect a sufficient volume, yet leave some air space when sampling for bacteria or suspended solids. Samples for volatiles and semi-volatiles should have no air bubbles.
- Properly identify each collected sample.
- Protect collected samples by properly packing them in ice for transportation.
- Samples should include proper chain-of-custody seals.
- The chain-of-custody must be maintained from the point of collection to the laboratory.

### **Surface Water Sampling Considerations**

- Do not sample during or immediately after a storm. Sample after storm-induced surface runoff has ceased and runoff continues under base flow conditions.
- Prepare a location for sampling
- Standing downstream of the sample container, place the mouth of the collection container below the water surface and facing flow. Avoid the capture of floating material.
- Keep hands away from the mouth of the jar.

### **Groundwater Sampling Considerations**

- Groundwater monitoring wells should be properly purged in accordance with the approved plans and the permit. Samples should be collected as soon as possible following purging (i.e., as soon as sufficient water is available). Wells should never be purged one day and sampled the next.

- The upgradient (background) well should always be sampled first.
- Provide a clean working surface at each well by placing a large sheet of plastic or aluminum foil around the well. After each use, dispose of all plastic, etc.
- The depth of water should be measured with a freshly cleaned instrument each time. Always BEFORE removal of water from the well.
- NEW plastic disposable gloves should be worn and changed between sampling of each well.
- The proper amount (3 well volumes) of water should be removed for each well BEFORE collecting a sample; or, micropurge stabilization parameters must have stabilized according to approved procedures.
- The bailer should ALWAYS be lowered slowly into a well to prevent disturbance of the water and to prevent the sample from becoming murky.
- All wells should be locked and inner casings should always have protective caps to prevent foreign matter from entering the well. Wells should also be protected with steel or concrete posts and clearly marked and labeled with appropriate well numbers (AKGWA). These well numbers (AKGWA) are those that are assigned by the Groundwater Branch, Division of Water.

**REMEMBER** – Assume ANYTHING inserted into a monitoring well could be DIRTY, can easily AFFECT your final result, and can ruin the well for future monitoring.

### **Testing for Explosive Gases**

In order to properly conduct testing for explosive gases the following equipment will be necessary:

1. Explosive gas detector
2. Weighted, insulated, bar hole punch

The explosive gas meter should read “percent lower explosive limit” and should have a flexible probe capable of being placed in subsurface holes made by the bar hole punch.

Landfills must not exceed:

- 25% of the Lower Explosive Limit (LEL) for methane in facility structures (excluding gas control or recovery system components)
- 100% of the LEL for methane at property boundary

Gas detector alarms, set at 25 percent LEL, must be installed and maintained in each facility structure. If methane gas levels are found to exceed the limits referenced above, the owner or operator must:

- take all steps necessary to ensure immediate protection of human health;
- immediately notify the Division of the exceedence and the remedial measures taken; and
- within 14 days, submit a remediation plan detailing the nature and extent of the problem and proposed remedy.

Managers should observe testing procedures or conduct the tests themselves according to the guidelines below.

### **Subsurface Testing**

Holes should be advanced into the ground by the bar hole punch, approximately 3 to 4 feet deep. The explosimeter probe should be carefully placed into the top 6 inches of the hole immediately after removing the hole punch. DO NOT allow soil or water (or other objects) to be drawn into the probe. This may damage or ruin the gas detector.

After inserting the probe, several volumes of air should be drawn into the gas meter while cautiously observing the needle. After obtaining the reading, remove the probe and clear the gas meter by allowing ambient air (air you breathe) to flow through the probe and detector until a reading of “0” is obtained. Seal the hole properly when finished.

### **Surface Testing**

This method consists of placing the probe in areas in and around the landfill vicinity and simply drawing a sufficient amount of air to obtain a reading.



## **Test Locations**

The sampling stations or locations will, at times be dynamic, but for the most part, certain areas should be tested at each round of testing. Underneath or at the lowest point of all buildings, basements, structures, manholes, pipes, etc., must be regularly tested. Set locations along the boundary, gas venting pipes and gas problem areas must also be monitored. Adjacent structures off site and off the property boundary should also be tested. The subsurface near all structures should be tested. Both surface and subsurface testing at the facility boundary should take place. Small, brightly colored surveyor flags are recommended to mark test stations for future sampling events.

## **Frequency**

Explosive gas testing should be conducted on a monthly basis through the spring (after the last freeze), summer and fall months (until the first freeze). Weekly testing programs should be conducted in the winter months. It may be appropriate to increase the frequency, depending on severity of the gas potential and other site specific conditions. The reason for more frequent testing during colder weather is that frozen soils will tend to retain gases within the landfill (actually seal the site) and allow potentially explosive conditions to develop. Quarterly monitoring is required by regulation and detailed later in the section.

## **Weather Conditions**

Exact weather conditions can affect explosive gas migration potential and should always be considered BEFORE beginning gas testing activities. The following conditions are optimal (the best) for testing:

- Just after a low pressure (thunderstorm or storm in general) has passed through the vicinity of the site. The low pressure will allow gases to escape more readily than high pressure.
- During time of extended freezing temperatures, the gases will not escape as easily. Potentially dangerous levels and quantities of gases can build up during cold weather.

## **Recordkeeping Requirements**

Solid waste regulations outline information to be provided as part of the technical application for all solid waste sites or facilities. This regulation (401 KAR 47:190 Section 8) specifies that a recordkeeping and reporting system must be established to document:

- Construction activities,
- Monthly quantity of waste received from each source,
- Compliance with soil cover requirements,
- Environmental monitoring (surface water, ground water, methane, etc.),

- Random inspections of incoming waste,
- Quantity and concentration of leachate removed,
- For contained landfills, spill residues and limited quantity generator wastes received, and
- Remaining landfill volume.

### **Documentation of Construction Requirements**

Each new landfill or existing sites applying for an expansion will be required to document the construction of:

- Liners,
- Hydrologic systems (e.g., surface water drainage devices and ground water well installation), and
- Leachate collection system.

The owner's qualified representative, ensuring that the facility was constructed in accordance with approved plans immediately upon completion, must submit a certification report.

Construction records are to be maintained onsite as a permanent record. The quarterly report for that reporting period should, at a minimum, show the construction completed to date as specified in the approved application. In the event the quarter ends and construction is incomplete, the quarterly record should, at a minimum, reflect the percentage of construction completed. The number of ground water or surface water monitoring wells installed should be shown, by well number, as identified in the approved site engineering plans.

### **Waste Quantity Records**

Sanitary landfills must have a system for documenting the amount of waste received at the facility on a monthly basis. The intent behind the collection of this data is to document the amount of waste being disposed of at sanitary landfills in the state. This information benefits local and state officials, as well as the landfill owner, who are charged with planning for and management of the solid waste stream.

### **Soil Cover**

Cover requirements exist for daily, interim, long term and final cover (see Operating Your Landfill section of this manual). Compliance with the requirements, specified in 401 KAR 48:170, 48:060, 48:070 and 48:080 relative to the specific type facility being designed, must be

documented. This documentation shall be maintained onsite as a reference document for use by operators, managers, inspectors and in compiling quarterly reports.

### **Screening Incoming Waste**

The owner or operator of a contained landfill must implement a program designed to prevent the disposal of regulated hazardous waste as defined in 401 KAR chapter 31 and polychlorinated bipheyls (PCB) wastes as defined in 40 CFR part 761. The requirements for this program can be found in 401 KAR 48:090 section 2 and should be included in the approved permit application.

This program includes:

- Random inspections of incoming waste,
- Inspections of suspicious loads,
- Records of inspections,
- Training of facility personnel to recognize regulated hazardous waste,
- Procedures for notifying the proper authorities if a regulated hazardous waste is discovered at the facility, and
- Employee safety, health, training and equipment to be used in the inspections.

### **Leachate**

The facility must document the quantity and concentration of leachate removed from the site, disposal location, and method of disposal. The concentration must be determined by utilizing the appropriate parameters specified in 401 KAR 48:300.

### **Additional Reporting Requirements**

Contained landfills must weigh all waste entering the landfill for disposal and must keep records on the source (county and state of origination) and quantity (in tons) of all wastes received. Disposal locations must also be recorded for all spill residues and limited quantity generator wastes received.

### **Quarterly Data Submittal**

401 KAR 47:190 section 8 requires quarterly reports be submitted to the Division of Waste Management to document compliance with specified recordkeeping requirements. Information supporting these quarterly reports shall be maintained onsite for at least three years for review by the regional inspector. Reports are to be submitted on forms approved by the

Division on the following schedule: first quarter reports cover the months of January, February and March – reports due April 15. Second quarter reports cover the months of April, May and June – reports due July 15. Third quarter reports cover the months of July, August and September – reports due October 15. Fourth quarter reports cover the months of October, November and December – reports due January 15.

With respect to environmental (groundwater, surface water, and methane) monitoring, the compliance monitoring reports are due within sixty days of sampling or fifteen days of the completion of statistical analyses, whichever is sooner, as required by 401 KAR 48:300 Section 7. In practice, this means that the latest date that a particular report can be submitted is the end of the second month following the end of the quarter. Therefore, the First Quarter report is due May 30, the Second Quarter report is due August 31, the Third Quarter report is due November 30, and the Fourth Quarter Report is due February 28. All environmental monitoring information, records filed, and all data utilized to compile the reports, must be maintained for the operating life of the facility plus the closure and post-closure care periods.

### **Annual Volume Survey**

All solid waste landfills must conduct an annual survey to determine remaining landfill volume, which may be used for waste disposal. The quantity of waste disposed per day shall be determined by dividing the total waste received in one year by 365 calendar days. This survey must bear the seal and signature of the engineer or land surveyor who conducted the survey on each page of the drawings. The owner or operator shall notify the Cabinet no less than 15 calendar days prior to the date the survey will be conducted. The annual survey must be made between January 1 and May 1 and should include the following:

- Cross sections on 100 ft intervals which show present waste disposal,
- Waste elevations and final contours, and
- Remaining available capacity in cubic yards.

This information must be submitted to the Division within 60 days of a walking survey or within 90 days if aerial photography is used on a form provided by the Division.

## **CHAPTER 7**

### **LANDFILL SAFETY**

#### Chapter 7 Behavioral Objectives

1. Recognize the importance of safe operations.
2. Identify how to establish a safety program.
3. List the associated hazards found at landfills.
4. Explain the different types of confined spaces and the importance of lock-out/tag-out.



## **CHAPTER 7**

### **LANDFILL SAFETY**

This section discusses the benefits of safety, outlines safety procedures and describes how to establish a safety program.

#### **Safety Regulations**

**Always comply with the regulations set forth in the Code of Federal Regulations (CFR), specifically 29 CFR 1910.146 and Kentucky's Occupational Safety and Health Standards for General Industry.**

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor develops and enforces comprehensive work practices and safety standards to protect American workers.

The “General Duty Clause [5(a)(1)]” of the 1972 OSHA establishes basic requirements employers must follow to provide their employees with a workplace free from recognized hazards.

#### **Importance of Safe Operations**

Safe operation of a landfill is only possible with the complete cooperation of all personnel participating in the operation. This cooperation can only be achieved when there is mutual trust and respect between members of management and labor employees. To maintain a safe workplace, management must demonstrate concern for the welfare of all employees. A safe workplace does not mean a workplace free of all risks; it does mean a workplace where every attempt is made, by all involved, to recognize and minimize hazards. Training each employee in the proper procedures to manage those hazards is just one important step in ensuring safe operations.

National Safety Council statistics indicate that injury rates for refuse disposal operations are 14 times the national average for other industries. No data has been presented for landfill operations, but the nature of the work being conducted at a landfill facility presents a special risk to both employees and customers. More than 80 percent of all accidents are caused by unsafe acts. Yet most accidents and resulting injuries are preventable.

Landfill operations involve certain risks because of the potential for encounters with heavy equipment. Hazards occur during collection, transportation, and processing, from foreign materials contained in raw materials, and from vectors, pathogens, noise, dust, fire, etc. Landfill activities involve risks; however those risks do not need to be unreasonable.

Fairness to workers requires that training be provided, including a thorough understanding of the risks and hazards present on the job, as well as how to deal with potential hazards.

The economic impacts of unsafe operations cannot be ignored. The effects of accidents and unprotected exposure to occupational hazards can and will overwhelm operational budgets. The direct cost of treatment for injuries or disabilities, employee death, equipment and facility damage, and increased insurance costs are far more than the cost of training and prevention. Furthermore, damage to workers morale and productivity will negatively affect the success of the operation.

In addition to fairness and economic concerns, safety on the worksite is mandated by U.S. Occupation Safety and Health Administration (OSHA) regulations. The Kentucky Occupations Safety and Health Review Commission adopted the regulations contained in 29 CFR part 1910 and Health Standards Board as 803 KAR 2:300 through 2:320. OSHA regulations require employers to make employees aware of hazards they face in the workplace. Additionally, they must be trained to respond to those hazards in a safe manner. While it is not in the scope of this manual to address all regulatory requirements, we will consider some of the basics.

**Benefits of Safe Operations:** Safe operations benefit the landfill owner, manager and operator. Benefits to the owner and managers include:

- Workers are on the job, not the injury list;
- Morale is higher due to a safe working environment;
- Accident insurance may cost less; and
- Equipments will last longer and need fewer repairs.

Benefits to the operator include:

- Avoid pain and possible permanent injury;
- No loss of wages or job security;
- Better chance for promotions and transfers; and
- Morale is high as free time can be enjoyed more fully.

**Remember: Your best protection against injury is your own attitude.**



## **Landfill Operations Safety Programs**

Safety training programs cover more than just holding safety meetings. These programs must also be used to identify hazards at your facility. All personnel must be trained to look for unsafe conditions or actions, and informed of the correct reporting procedures so hazards can be mitigated. The development of the landfill operation safety program should include evaluation of hazards encountered in the normal workday, and developing procedures to reduce those hazards. Implementation of hazard reduction procedures can be achieved through a comprehensive safety program.

**Risk Assessment:** You should assess and prioritize existing hazards.

- Identify all adverse effects of those hazards.
- Under what situations could the hazard occur?
- If an accident happens, what are the results?
- Evaluate conditions of exposure and affects.
- Assess the degree of harm from a given affect/exposure. The effect to the person, if the hazard happens, divided by the number of exposures in a period time.
- Develop control methods and procedures that minimize the harm to employees and the public.

**Program Monitoring:** Monitor and update your program as needed on an annual basis at a minimum.

- Check to see if control methods and procedures are working for known hazards.
- Set up a system to check for potential new hazards.
- Develop new control methods and procedures when new activities are undertaken at the landfill.
- Hold regular meetings to discuss causes and methods of preventing accidents.

**Reporting Procedures:** All personnel at the site must know the procedures for reporting accidents, injuries, fires and other unusual occurrences. Procedures should be posted by the phone and in the safety program documentation.

**Records:** Accurate records are very important to comply with state and federal safety regulations and to maintain an incentive program to help reduce accidents. In addition, records will provide an indication of the effectiveness of the safety program.

## **Landfill Hazards**

Associated hazards can be divided into three broad categories: chemical, physical and biological. We will examine each of these categories.

### **Chemical Hazards**

**Employee Right to Know (29 CFR 1910.1200):** The first steps in developing a safety program are to 1) identify all chemical hazards and to 2) ensure that all employees are informed. This means that employees have the right to know the identity of all hazardous chemicals they will encounter in the workplace, understand the health effects of exposure, and know and understand how to work safely with those materials. This information must be provided in writing and be available at all times. Generally, there are not a great number of different hazardous chemicals or materials on a landfill site. However, a survey and inventory should be conducted to assure the proper Material Safety Data Sheets (MSDS) are available.

### **Material Safety Data Sheet (29 CFR 1910.1200)**

Material Safety Data Sheets (MSDSs) shall be in English. MSDSs shall be available for all hazardous materials onsite at all times, and shall contain the following information:

- The chemical manufacturer's name, address, emergency telephone number;
- The chemical's name, trade name and chemical formula;
- The physical and chemical characteristics of the chemical (such as vapor pressure, flash point);
- The physical hazards of the chemical, including the potential for fire, explosion and reactivity;
- The health hazards of the chemical, including signs and symptoms of exposure and any medical conditions which are generally recognized as being aggravated by exposure to the chemical;
- The chemical's primary route(s) of entry;

- The OSHA permissible exposure limit (PEL), ACGIH Threshold Limit Value (TLV) and any other exposure limit used or recommended by the chemical manufacturer, importer or employer preparing the MSDS, where available;
- Whether the chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition), or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition ), or by OSHA;
- Any generally applicable precautions for safe handling and use which are known to the chemical manufacturer, importer or employer preparing the MSDS, including appropriate hygienic practices, protective measure during repair and maintenance of contaminated equipment and procedures for clean up of spills and leaks;
- Any generally applicable control measures that are known to the chemical manufacturer, importer or employer preparing the MSDS, such as appropriate engineering controls, work practices or personal protecting equipment;
- Emergency and first aid procedures in case of chemical contact; and
- The date of preparation of MSDS or date of last change made.

### **Protection from Chemical Hazards**

Hazardous materials may enter the body by inhalation (most common), ingestion, absorption through the skin and eyes, or injection. The primary ways workers are exposed to hazardous chemical include:

- Lack of knowledge of the materials;
- Failure to follow proper procedures or to use appropriate personal protective equipment (PPE);
- Failure to decontaminate oneself or equipment; or
- Carelessness, such as walking through puddles or into clouds of unknown vapors, or consuming food, water or smoking cigarettes contaminated by contact with gloves, equipment, or unwashed hands.

Once information on the chemical hazard has been obtained, the employer and employee can select the proper PPE for working with the chemical. The employer must make sure employees are properly trained in the use of the selected PPE.

## **Physical Hazards**

Physical hazards are abundant at landfill operations. Hazards range from the exposure to large equipment, electrical hazards and confined spaces, as well as minor injuries such as cuts, strains, sprains, bruises and abrasions. Injuries can occur because of slips and falls, improper lifting, incautious backing of equipment, improper confined space entry, failure to properly lock-out/tag-out energy sources, and improper use of hand or power tools.

While most injuries are minor, serious injuries or deaths may result. Prolonged exposure to loud noises may permanently damage hearing. Failure to lock and tag energy sources and improper confined space entry may result in fatalities. Exposure to heat and cold may cause heat stroke or frost bite and can lead to indirect effects such as fatigue, dizziness and confusion which in turn can lead to accidents, injuries and death.

## **Equipment Operation**

Every equipment operator should receive thorough instruction on safe use of equipment. The following guidelines are few examples that should be followed for equipment operation:

- Checked for defects before starting. Do not start or operate defective equipment.
- Be aware of your surroundings. Always look around work area to locate persons and/or other equipment.
- Clear a path. Walk around the machine and look for people and other equipment before moving equipment.

## **Operator Protective Equipment**

There are many types of protective equipment available. Operators should use protective equipment to prevent injury. Some of the equipment available for operators includes:

- Hearing protection – reduces the potential of hearing loss from excessive noise.
- Hard hat – protects wearer from collision with stationary, falling and flying objects.
- Safety shoes – protects feet from crushing and puncture hazards.
- Safety goggles – protects eyes from dust, flying objects and chemical contact.
- Gloves – protects hands from sharp objects and chemical exposure.
- Long-sleeved shirts and trousers – protects from exposure to sunlight, dust, liquids, chemicals, insects and flying objects.

- Fluorescent vests – makes the wearer more visible to others in the work area.
- Respirators – protects wearer from exposure by inhalation for dusty operations (asbestos, fiberglass, ashes, etc.).

## **Biological Hazards**

Workers at a landfill can potentially be exposed to biological hazards. Appropriate precautions must be taken. Materials such as glass, metals, used needles and other sharp objects offer a significant risk of puncture to the skin. If a puncture occurs, pathogenic organisms can be introduced into the body. These organisms may arise from human or animal waste sources.

Wastewater plant sludge is of human origin. This kind of sludge can be decontaminated by undergoing one or more of the following processes: 1) a Process to Significantly Reduce Pathogens (PSRP), or 2) a Process to Further Reduce Pathogens (PRFP). Wastewater plant sludge that has not undergone PRFP or PSRP represents increased risk of exposure to landfill workers, because the sludge is likely to contain pathogenic organisms in high concentrations.

Bloodborne pathogens are of human origin, and highly hazardous to workers. The Occupational Safety and Health Administration (OSHA) defines blood to mean human blood, human blood components, and products made from human blood. Bloodborne pathogens may cause serious illness or disease, like Hepatitis B, Hepatitis C, HIV/AIDS, and others. Workers need to be highly cautious of materials in the waste stream containing human body fluids, such as semen, vaginal secretions, brain and spinal fluids, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids where it is difficult or impossible to differentiate between body fluids.

Mold and fungi are another type of biological hazard that may be encountered at landfills. Molds and fungi can cause allergic reactions, such as rashes, swelling, or difficulty breathing.

It's important for all employees to be aware of the possibility of exposure and know the steps they must take to reduce risk factors. As with the risk from chemical and physical hazards, selection of the proper PPE and personal hygiene will greatly reduce the risk of biological exposure.

## **Fire Safety**

Equipment and buildings are required to have proper fire extinguishers that are checked regularly and serviced as needed. Employees must be trained in the proper use of fire extinguishers. Different types (classes) of fires require different types of fire extinguishers. The following is a list of the different fire classes:

- Class A Fires – occurring in wood, clothing, paper, rags and other solid materials.

- Class B Fires – occurring in flammable liquids, such as gasoline, fuel, oil, lube oil grease, some solvents, paints, etc. The materials needed to extinguish type B fires are those that dilute or eliminate the air by blanketing the surface of the fire to create a smothering effect.
- Class C Fires – occurring in electrical equipment and facilities. The extinguishing agent for this type of fire must be non-conductive of electricity and provide a smothering effect.
- Class D Fires – occurring from the chemical reaction of metal compounds such as aluminum, magnesium, phosphorous, etc.

### **First Aid**

First aid kits should be readily available to everyone at the site. The kits should be clearly marked and highly visible. Staff should be made aware of the first aid kit location. The kit should be maintained so supplies are stocked on a regular basis, and so that supplies do not expire.

At least one person at the site should have a first aid certificate. Contact the nearest Red Cross Chapter or education facility to receive information on the first aid course(s) offered. Approximately eight (8) hours of training is needed for the certificate.

### **Confined Space Entry**

A confined space is large enough an area that an employee can enter bodily and perform work; has limited or restricted means of entry or exit; and is not designed for continuous human occupancy. In 29 CFR 1910.146b, OSHA defines a non-permit confined space as a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. Permit-required confined spaces are those have the potential to contain any hazard capable of causing death or serious physical harm.

Confined spaces are generally entered infrequently for cleaning, inspection and repair. OSHA has identified over 238,000 workplaces with confined spaces. There are approximately 12.2 million workers employed at facilities with confined spaces. About 13% of those workers enter over 4.8 million permit-required confined spaces each year.

**Training in confined space entry can be obtained through OSHA workshops.** The following sections discuss confined spaces and some associated hazards.

### Examples of Confined Spaces:

Bins	Pits
Boilers	Sewers
Ducts	Silos
Furnaces	Tanks
Hoppers	Trenches
Manholes	Tunnels
Pipes	Vaults

### Confined Space Injuries and Deaths

According to data collected by the U.S. Department of Labor (USDOL), Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) program, fatal injuries in confined spaces fluctuated from a low of 81 in 1998 to a high of 100 in 2000 during the five-year period, averaging 92 fatalities per year. There are approximately 1.6 million workers who are at risk from entering confined spaces in U.S. workplaces. OSHA estimates that compliance with the permit-required confined space standard could reduce fatalities, injuries and illnesses by 80 to 90 percent. On a yearly basis this means that 54 fatalities, 5,041 lost workday cases and 5,908 non-lost workday cases could be prevented. Compliance with safety standards will prevent nearly all work related confined space accidents and prevent additional injury and death to rescuers responding during emergencies.

### Confined Space Hazards

Confined space hazards include several conditions: those conditions which poses an immediate threat to the health or life of an entrant; conditions that would cause irreversible adverse health effects; or conditions that would interfere with an individual's ability to escape unaided from a permit space. Some of these hazards are listed below.

- Oxygen deficiency - <19.5% or >23.5% oxygen concentration
- IDLH (Immediately Dangerous to Life or Health) atmospheres
- Combustibles:
  - Methane
  - Hydrogen
  - Acetylene
  - Propane
  - Gasoline fumes
- Toxic materials:
  - Carbon monoxide
  - Hydrogen sulfide
  - Welding fumes
  - Corrosives
- Electricity
- Mechanical hazards
  - Mixers
  - Crushers

### **Contractor Confined Space Entry**

Contractors must be informed of the hazards within the space. Contractors must follow their own established confined space entry procedures, and train their own personnel. However, owners and operators should ensure the emergency response teams are available prior to entry.

### **Lock-out/Tag-out - Control of Hazardous Energy Sources**

OSHA Standard 29 CFR 1910.147 requires employers to develop and use an energy control program. All potentially hazardous energy shall be isolated and locked out. Kentucky OSHA standard has determined that lock-out is a surer means of ensuring de-energization of equipment than tag-out, and that lock-out is required when achievable.

The OSHA energy control program must include step-by-step procedures for affixing lock-out/tag-out devices to prevent unexpected energization, start up or release of stored energy. The energy control program procedures should establish the minimum requirements for the lock-out of energy sources, excluding small capacity snap switches near machines. Lock-out tags should appear in plain sight to protect employees from unexpected releases of energy that could cause injury.



Each employee needs to know the hazards of unexpected equipment energization or startup. Equipment may store energy in several forms including: electrical, mechanical, hydraulic, pneumatic, etc. Lock-out can prevent injuries and death from these energy types.

### **Training and Responsibilities**

All authorized and affected employees shall be instructed in the safety significance of the lock-out procedures by their supervisor. Each new or transfer employee shall receive the same instruction.

### **Employee Classifications**

The **Authorized employee** is the person who locks out the machine in order to service or perform maintenance under lock-out. An affected employee whose duties include performing, servicing or maintenance is also covered under this classification and need special training and authorization to perform lock-out.

The **Affected employee** is the person whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lock-out, or whose job requires the employee to work in an area in which such servicing or maintenance is being performed.

**Other employees** are persons who might be exposed to a machine that never works or operates it. A good example is office personnel or company accountant.

### **Lock-out/Tag-out Hazards and Prevention**

When working on equipment they believe has been shut off, employees can be seriously injured when performing tasks such as:

- Cleaning;
- Checking mechanical or operation problems;
- Repair; and
- Maintenance.

Employer lock-out/tag-out procedures must include:

- Preparation for shutdown;
- Equipment isolation;
- Lock-out/Tag-out application;

- Release of stored energy;
- Verification of isolation; and
- Training for authorized, affected, and other employees.

**Further training in lock-out/tag-out procedures can be obtained through an OSHA workshop.**

## **CHAPTER 8**

### **LANDFILL EQUIPMENT**

#### Chapter 8 Behavioral Objectives

1. Understand the tasks associated with operations of a landfill and the types of equipment needed.
2. List the steps in an effective maintenance program.
3. Comprehend regulations for each type of landfill and equipment that is needed.



## **CHAPTER 8**

### **LANDFILL EQUIPMENT**

This section discusses operational considerations, equipment maintenance programs, and equipment related regulations.

#### **Operational Considerations**

Equipment is necessary for many different tasks at a landfill. Therefore, it may be required to have more than one type of equipment available. Tasks to be considered when choosing equipment are:

- **Hauling of Cover Material**
  - Volume required;
  - Distance cover material transported; and
  - Condition of the soil to be excavated.
- **Waste and Soil Cover Compaction**
  - Type and amount of solid waste being compacted;
  - Type and depth of cover material;
  - Number of passes machine is required to make;
  - Minimum weight and horsepower requirements; and
  - Peak rates of waste disposal (tons per hour).
- **Supplemental Tasks**
  - Site clearing;
  - Maintaining access road(s); and
  - Excavating trenches.
- **Machine Availability**
  - Recommended usage rates (capacity in units per hour);
  - Backup equipment availability;
  - Consideration of machine warranties when purchasing; and
  - Estimated cost of machine repairs and labor for the life of the machine.

## **Equipment Types**

Most common equipment utilized in daily landfill operations are the following:

- **Dozers**
  - Track-Type
  - Rubber Tire
- **Steel Wheeled Compactors**
- **Front-end Loader**
  - Track Type
  - Rubber Tire
- **Scrapers**

### **Other Equipment Used at Landfills**

There are several types of equipment needed for daily landfill operation, not just equipment specializing in waste and cover tasks. The following is a list of other such equipment with the tasks that they can perform:

- **Motors (i.e. Graders)**  
Construction and maintenance of roadways, drainage, and final grades.
- **Hydraulic Excavators**  
Loading trucks, drainage work, cleaning of sediment ponds and handling baled waste.
- **Backhoe/Loaders**  
Excavating leachate trenches, cleaning frozen roll-off boxes and other miscellaneous needs.
- **Soil Stabilizers**  
Large rotary hoe type machine is useful in conditioning soils for liners.
- **Soil Compactors**  
Heavy (44,000 pounds) equipment is needed for construction of soil liners. Non-vibratory types are required by 401 KAR 47:190 section 6(2)(a).

## **Equipment Extras and/or Modifications**

Equipment add-ons and/or alterations can be utilized to improve the equipment's effectiveness, provide protection to vital components, etc. The following are a few places where such extras and/or modifications can be used:

- **Tracks**
- **Bottom Portion of Equipment**
- **Radiator**
- **Engine**
- **Hydraulic System**
- **Dozer Blade**
- **Bucket**

## **Selecting Equipment**

Equipment selection can be particularly difficult for a site where only one machine will be used. The machine must be capable of spreading and compacting solid waste and cover material, as well as having to excavate trenches or cover material. Remember, just because a piece of equipment has exceptional performance in some activities, there is no guarantee that it will be exceptional for all needed activities. You should select a machine that will give high performance in all use categories.

Table 7-1 (below) gives characteristics of equipment performance in landfills.

## Maintenance

**TABLE 7-1**

EQUIPMENT	SOLID WASTE		COVER MATERIAL			
	SPREADING	COMPACTING	EXCAVATING	SPREADING	COMPACTING	HAULING
CRAWLER DOZER	E	F	E	E	F	N/A
CRAWLER LOADER	G	F	E	G	F	N/A
RUBBER-TIRED DOZER	G	G	F	G	G	N/A
RUBBER-TIRED LOADER	G	G	F	G	G	N/A
LANDFILL COMPACTOR	E	E	P	G	G	N/A
SCRAPER	N/A	N/A	G	E	N/A	E
TRUCKS-OFF ROAD	N/A	N/A	N/A	N/A	N/A	E

\*Basis of evaluation: Easily workable soil and cover material haul distance greater than 1,000 ft.

Rating Key: E = Excellent    G = Good    F = Fair    P = Poor    N/A = Not Applicable

Construction/Demolition/Debris (CDD) and Contained Landfills are required to have sufficient equipment to spread and compact all wastes received. In addition, backup equipment must be readily available in case the main equipment breaks down. Because the equipment is so essential to daily operations Proper maintenance of equipment is a priority. Benefits of proper maintenance and repair include:

- Maximizes equipment effectiveness and equipment life;
- Minimizes equipment breakdown and excessive repairs;
- Allows for reliable service to public;
- Minimizes injuries from faulty equipment;
- Helps maintain sanitary conditions at landfill; and
- Minimizes downtime.

Contained landfills are required to have an equipment operating and maintenance recordkeeping program.



This program must allow a landfill to track, at a minimum, availability of primary and backup equipment utilized for:

- Spreading, covering, and compacting waste;
- Maintaining road and drainage features;
- Dust suppression; and
- Maintaining leachate and methane gas systems.

## **Maintenance**

### **Daily Maintenance Program**

Daily maintenance programs are divided into periodic maintenance and predictive maintenance. Periodic maintenance is like when you change the oil on your car every 3,000 miles. All equipment has periodic needs, and should be checked on a regular schedule. Preventive maintenance are things you can do to prevent a piece of equipment from breaking down. Just like human life is extended by preventive medicine, the equipment service life can be prolonged by doing preventive maintenance. Equipment manufacturers have recommended schedules for both periodic and preventive maintenance services. Follow these recommended schedules for each machine.

In addition to reducing costs and saving time, having daily equipment checks help avoid accidents that may result in death or injury to operating personnel.

### **Preventative Maintenance**

Daily maintenance programs are designed to keep equipment in peak condition and prevent failure. Maintenance of equipment is achieved by preventing deterioration. Some maintenance procedures may include cleaning, inspection, oiling, and re-tightening. Other procedures may include checking the safety brakes, parking brake, and backup alarm.

### **Periodic Maintenance Program**

Periodic inspections are a form of time based maintenance. Periodic programs conduct inspections on a regular time interval schedule. These programs consist of inspecting, servicing and cleaning equipment, as well as replacing parts to prevent sudden failure and process problems. Periodic inspections typically take place at every 125 hours, 250 hours, 500 hours, and 1000 hours of equipment usage.

## Other Maintenance Programs

The Predictive Maintenance Program is a method in which the service life of important parts is predicted based on inspection or diagnosis. This kind of program allows parts to be used for the duration of their service life. Compared to periodic maintenance, predictive maintenance is condition based maintenance. Predictive programs manage trend values by measuring and analyzing data about deterioration, and employing a surveillance system designed to monitor conditions through an on-line system. This method is rather new and not widely utilized.

## Equipment Regulations

Each section below lists important regulations that apply to equipment for different kinds of landfills. Be sure to read the “**Note**” portions where they appear under each landfill section.

### Construction/ Demolition Debris Landfills

- All compaction equipment to be used for site operation shall have a minimum weight of 30,000 lbs and a minimum 130 horsepower motor. Sufficient equipment shall be listed on the application to handle the cover requirements in subsection (3) of this section as well as working cell grading and compaction. (401 KAR chapter 48:060, Section 1(5))
- Adequate soil material shall be available to provide one foot of compacted cover on lifts of every 10,000 square feet, at the end of each working week, or at intervals sufficient to reduce fire hazards, prevent an unsightly appearance, and eliminate disease vectors (401 KAR 48:060 section 1(3)). **Note:** Alternate daily cover material may be used with the Cabinet’s written approval. Alternative daily covers are materials that shed water, resist poking by boards and pipes, and are inflammable.
- Operating equipment shall be onsite during operating hours and capable of spreading and compacting the volume of waste received at the site. Backup equipment shall be available within one week of primary equipment breakdown. (401 KAR 48:060 section 2(12))
- Before earth-moving equipment is removed from the site, an inspection of the entire site shall be made by an authorized representative of the Cabinet to determine compliance with approved plans and specifications. The owner or operator shall present the quality control records demonstrating compliance with the permit. (401 KAR 48:060 section 3(1)(e))

## Contained Landfills

- Sufficient equipment shall be available to spread and compact all wastes within two (2) hours of receipt. (401 KAR 48:070, Section 6(1))
- Steel wheeled compactors, designed for landfill operation, shall be specified for residential and solid waste compaction. (401 KAR 48:070, Section 6(2))
- The owner or operator shall provide the landfill equipment required to (401 KAR 48:070, Section 6(3)):
  - Handle all daily, interim, long term and final cover requirements;
  - Maintain all roads and drainage features;
  - Provide dust suppression;
  - Maintain leachate and methane gas systems; and
  - Properly compact waste at peak receipt rates. These rates shall be determined in tons per hour and kept on file with the Cabinet.
- Backup equipment shall be available for waste spreading and compaction, application of daily cover and maintenance of leachate systems within twenty-four (24) hours of primary equipment incapacitation. (401 KAR 48:070, Section 6(4))
- Landfill compactors shall have a minimum gross ground pressure of 325 lbs per linear inch of wheel width. (401 KAR 48:070, Section 6(5)) **Note:** There have been problems with this specification apparently pointing to one brand. The Cabinet will grant a variance to use another brand if the 1,200 lbs/cu yd density goal is achieved.
- Any equipment used for compaction shall have a minimum gross weight of 30,000 lbs and a minimum of 130 engine horsepower. (401 KAR 48:070, Section 6(6))
- The primary working face equipment used for waste spreading and compaction shall have the standard landfill guard package offered by the manufacturer, or an otherwise reasonable adaptation, to provide protection from waste damage hazards and other landfill operating hazards. (401 KAR 48:070, Section 6(7))
- The operator shall propose an equipment operating and maintenance recordkeeping system. The system shall, at a minimum, track the availability of each piece of equipment in subsection (1) and (4) of this section. (401 KAR 48:070, Section 6(8))
- Any equipment used for waste compaction shall have a specified maximum rated capacity. (401 KAR 48:070, Section 6(9))

- Compaction for residential solid waste, the in place waste density goal shall be to achieve greater than 1,200 lbs/cu yd in completed cells. The density shall be determined by dividing the total weight of waste received by the cubic yards of airspace used. The landfill density shall be computed annually per 401 KAR 48:070 sections 6 and 7. (401 KAR 48:070, Section 7)
- Each landfill site shall include a building for maintenance of equipment. The building shall be large enough to hold the largest piece of equipment required for site operation. The building shall be heated for winter repair operations. (401 KAR 48:070 section 9(2))
- Soil sub-grade shall be proof rolled using a minimum 100,000 lbs loaded four tire scraper (twenty cubic yard size) or equivalent. This procedure and equipment shall be approved by the Cabinet per 401 KAR 48:080, Section 3(3)(b).
- Within two hours of receipt, the owner or operator shall spread wastes in loose layers (not exceeding twenty-four inches in depth) compacted to the maximum practicable density. The owner or operator shall use the equipment specified in the permit for compaction. The operator shall pass the equipment over 100 percent of the waste surface at least four times. Each loose layer shall be fully compacted before any additional waste is placed. (401 KAR 48:090, Section 9(1))
- The owner or operator shall not place any object in the initial lift that could damage the bottom liner. The liner system shall be protected with a layer of dirt, waste or similar blanket of material placed between the operating equipment and liner. (401 KAR 48:090, Section 9(3))
- The owner or operator shall not accept solid waste at a rate that exceeds the rated capacity of operational compaction and cover equipment available onsite. (401 KAR 48:090, Section 9(8))

### **Residual Landfill**

- The owner or operator of a residual landfill shall operate the facility in such a manner as to ensure compliance with the EPS outlined in 401 KAR 47:030. (401 KAR 48:170, Section 2(2))

### **Construction**

- The construction quality control plan shall provide assurance that the layers of homogeneous low permeability soil liners, if required, are compacted using non-vibratory compactors with full depth penetrating feet with a minimum of six passes per soil layer. The compactor ballast shall be varied to prevent reaching the desired proctor density within less than six passes. The foot length shall be one inch longer than the loose soil layer thickness. (401 KAR 45:110, Section 2(2)(a))

- Smooth roller may be used at the end of each work period to seal the surface from rain infiltration. (401 KAR 45:110, Section 2(2)(b))

**Special Waste**

- The owner or operator of a special waste landfill shall operate the facility in such a manner to ensure compliance with 401 KAR 30:031. (401 KAR 45:110, Section 3(2))



## **CHAPTER 9**

### **FACILITY MANAGEMENT**

#### Chapter 9 Behavioral Objectives

1. Understand management responsibilities at a landfill.
2. Understand the purpose of a Solid Waste Management Plan.
3. Explain the relevance of KRS 224.40-310 to landfill applications.
4. Understand the steps in landfill planning.
5. Explain the importance of the compaction rate in the management of the landfill.
6. Explain the individuals and their roles in developing and operating a landfill.
7. List what items should be included in proactive public relations.
8. Understand the landfill closure practices.
9. Explain what is involved in compliance monitoring and how it relates to notices of violation.





## **CHAPTER 9**

### **FACILITY MANAGEMENT**

This section describes management responsibilities regarding all phases of the landfill (planning, financing, monitoring, closure, etc.), personnel management and public relations.

Landfills are privately or publicly owned. Depending on the size of the operation and/or whether the operation is contracted to another party, a landfill may have one or more individuals responsible for management of the solid waste site or facility. Management responsibilities include:

- Planning,
- Designing,
- Financing,
- Permitting,
- Cost accounting,
- Overseeing the operation (operating plan),
- Recruiting and training personnel,
- Public relations,
- Compliance,
- Site closure, and
- Closure care maintenance.

#### **Planning**

Kentucky law requires each county or multi-county district to prepare, adopt, and implement a comprehensive Solid Waste Management Plan. The purpose of the plan is to analyze all solid waste management issues in the county, evaluate the existing system and propose for implementation a means of managing (both short and long term) the county's solid waste.

Disposal (landfilling) is one issue addressed in this process. Each plan gives a detailed description of the facility where the county's waste is disposed.

The description includes the:

- Name,
- Type,

- Location,
- Life expectancy,
- Ownership,
- Operational costs,
- Cost to users, and
- Levels of compliance with all state and federal laws.

The county is responsible for obtaining a formal agreement with the disposal facility to assure acceptance of their waste through the short term planning period. Where no permitted facility is currently available to the area, the plan identifies an alternate site to be utilized and describes the strategy that is to be undertaken to obtain access to a disposal facility. The intent is to describe how residents within the planning area will, within the short term planning period, dispose of their waste in an environmentally and legally sound manner.

The governing body is ultimately responsible for the preparation and implementation of the approved solid waste management plan. Therefore, the manager of a landfill should consult with local officials on a regular basis. If changes arise in current disposal methods that will affect the community's short or long term needs, whether it is due to changes at the existing disposal site or decisions by the fiscal court, further planning will be required and the county's plan will need to be modified. Substantial changes to the plan must be public noticed to ensure that all entities within the solid waste management area are advised.

As a result of KRS 224.40-310, all landfill applications for contained, residual and construction/demolition/debris (and any additional capacity expansions) must first be submitted to the local solid waste management area's governing body. The governing body makes a determination concerning the consistency of the application with the area solid waste management plan within sixty days.

The applicant submits a Notice of Intent to apply for expansion to the Division. This constitutes the start of the Cabinet's 180 working day review time. After a review of the Notice of Intent, Administrative and Technical Applications, a preliminary determination is made to issue a permit. At this time, a written finding by the Cabinet is made regarding consistency with the state and area solid waste management plan.

### **Estimating Waste Volume and Type**

In order to estimate the daily quantity of residential and commercial waste for the area, one multiplies a generation rate (e.g., pounds per capita per day) by the population. For an average community, this approach will provide a rough, first cut estimate of the amount of waste discarded each day. The reliability of the estimates will be improved if weight data exists to develop a local generation rate, rather than rely on a nationwide rate. Future waste estimates

must account for both population growth and increases in generation rates. EPA uses currently 4.4 pounds per capita per day as a national average, up from 2.7 in 1960 and 3.7 in 1980. This figure is holding steady.

For more information, visit the EPA's website on Municipal Solid Waste at  
<http://www.epa.gov/garbage/facts.htm>

or

<http://www.epa.gov/epaoswer/non-hw/muncpl/mswrpt98/98charac.pdf>.

Industrial waste estimates are obtained by contacting the specific plant of multiplying an industry wide generation rate, by manufacturing type, by the number of employees in the industry.

Waste quantity will vary with the season of the year due to changes in composition. The calculated waste quantity will only be an average and will fail to reflect high and low periods of waste generation. During the summer, waste quantity is typically at its highest and is at its lowest in the winter.

## **Design**

Managers are usually not directly responsible for designing a landfill. An engineer performs this task. However, the manager must work closely with the design team to see that everything regarding the particular site and waste volumes received or anticipated is considered in the design phase.

To assure that the site is operated well, the manager is also responsible for:

- Knowing the regulatory and statutory requirements,
- Knowing the contents of the permit document, and
- Reading and interpreting the engineering plans.

## **Landfill Expenses**

The following expenses can be associated with a landfill:

### **Pre-development**

- Land cost,
- Design fees (\$2 to \$3 million for a contained landfill),
- Permit fees (see 401 KAR 47:090),
- Legal fees (see your lawyer), and
- Financing costs (see your banker).

**Site Preparation and Construction Costs:**

- Access road,
- Sign and gate,
- Scales,
- Fencing,
- Clearing and grubbing,
- Topsoil excavation and placement,
- Subsoil excavation and placement,
- Off site soil hauling,
- Leachate collection system (piping, backfill material, manholes, lift station, tanks),
- Drainage controls (ditches, sediment basin), and
- Erosion controls

**Operation:**

- Equipment,
- Labor,
- Fuel,
- Utilities,
- Maintenance,
- Supplies,
- Administrative costs,
- Leachate collection, hauling and treatment (control surface water!),
- Annual fees (see 401 KAR 47:090),
- Monitoring,
- Engineering,
- Map updates and annual survey, and
- Garbage collection system maintenance.

**Site Closure:**

- Final cover (cap),
- Topsoil (stock piled),
- Seed, fertilizer and mulch,
- Gas venting,
- Building removal and site restoration, and
- Documentation of closure.

**Post Closure Site Care and Maintenance:**

- Monitoring,
- Groundwater,
- Surface water,
- Leachate,
- Gas,
- Leachate hauling and treatment,
- Collection system maintenance,
- Site inspections,
- Corrective action, if any, and
- Final certification.

**Cost Accounting**

Choose a system, with the advice of your accountant, which looks at the overall costs of a landfill, including equipment amortization and future construction, operations, closure, post closure and monitoring costs.

The U.S. EPA recommends that cities and counties look at the overall costs of a municipal solid waste collection and disposal system using Full Cost Accounting. Full cost accounting (FCA) provides decision makers with a method of compiling detailed cost information on MSW services in their communities. Knowing what MSW management really costs enables local government officials to make informed decision about their programs, identify opportunities for streamlining services, facilitate cost saving efforts and better plan for the future.

FCA is different from other common government accounting practices. It help decision makers understand the direct and indirect operating costs of MSW services, as well as upfront (past) and backend (future) expenses. Through FCA, decision makers systematically identify, analyze and report all the monetary costs of resources associated with MSW management activities, including:

- Acquisition of equipment and materials,
- Siting and construction of facilities,
- Collection and disposal of MSW,
- Collection, processing and marketing of recyclables,
- Transportation,
- Operation and maintenance of facilities (e.g., transfer stations, landfills and materials recovery facilities),
- Clean up of illegal dumping sites,
- Landfill closure and post closure,
- Program promotion, and Administration/overhead.

Many local governments use cash flow accounting, which is based on cash outlays (when the cash flows) and not on costs (when the resource is used). These costs can be obscured using cash flow accounting because communities can incur insignificant expenditures before and after the operating life of specific management services. For example, in cash flow accounting systems, capital expenditures for garbage trucks and recycling equipment are recognized entirely in the year of purchase, while FCA spreads the expenditures over the useful life of the item. Also, cash flow accounting does not consider future costs that are directly related to current activities, such as landfill closure and post closure. For all these reasons, cash flow accounting can give a distorted picture of the actual costs of MSW management.

**FCA recognizes upfront, operating and backend costs.**

**Upfront costs include:**

- Acquisition of building, vehicles, equipment and landfills,
- Operating costs include salaries and wages, power and fuel, supplies,
- Tipping fees, and
- Indirect (overhead) costs including services such as:
  - ✓ Executive oversight,
  - ✓ Legal services,
  - ✓ Data processing,
  - ✓ Billing, and
  - ✓ Purchasing.

**Backend costs include:**

- Landfill closure and post closure, and Retirement benefits.

FCA does not take into account environmental, health and social costs. These costs cannot be measured easily or valued readily in the marketplace. Consideration of the full spectrum of costs could be called “true cost accounting” or “environmental accounting”, which is beyond the scope of FCA. FCA is a method of accounting for all monetary costs of resources used or committed, thereby providing managers with the whole picture of MSW management costs on an ongoing basis. It goes beyond the limits of cash flow accounting, but does not negate cash flow principles.

Private companies should use the same principles of FCA in their planning, forecasting and accounting systems.

**Operating Plan**

The permit documents and regulations, as they are currently prepared, do not provide concise guidance for the systematic operation of a landfill. These documents serve multiple purposes. Therefore, it is incumbent upon the owner or operator to prepare a written plan to detail the duties of the operator(s) and the manager such that the landfill is economically operated and stays in compliance with its permit.

**For the Site Operator****Daily:**

- Opening the site,
- Safety checks,
- Check equipment,
- Designate areas to fill,
- Supervise unloading,
- Move daily cover or Alternate Daily Cover Material (ADCM),
- Spread and compact waste,
- Record waste sources and volumes received,
- Record any random waste inspections,
- Monitor industrial and commercial waste streams,
- Perform leachate system checks,
- Finish daily waste placement, and
- Apply daily cover or ADCM.

**Weekly:**

- Maintain and service equipment, and
- Perform the OSHA safety review with operating personnel.

**Monthly:**

- Check leachate systems,
- Check application of interim cover,
- Re-grade cover for erosion,
- Install erosion control measures,
- Verify proper borrow pit location and waste placement,
- Check surface water drainage in waste area, and
- Check equipment services.

**Semi-Annually:**

- Maintain erosion controls, and
- Re-seed bare spots.

**Annually:**

- Apply 18 inch thick long term (winter) and final cover.

**For the Site Manager****Daily:**

- Document the amount/area and location of daily cover or ADCM applied,
- Verify that operators are onsite and complete daily assignments, and
- Verify that operators know where to place waste and otherwise operate per the permit.

**Weekly:**

- Visit site,
- Assure that the operation is in compliance with the operating scheme of permit,
- Review records,
- Review accidents and safety, and



- Verify equipment maintenance.

### **Monthly:**

- Survey landfill by expedient means to verify progress of fill per plans,
- Designate areas to receive interim or long term cover,
- Direct erosion control measures,
- Monitor methane levels,
- Conduct water samples,
- Verify borrow pit usage is acceptable per the plans, and
- Review performance against regulations and permits.

### **Quarterly:**

- Sample and report groundwater,
- Sample and report surface water,
- Sample and report methane,
- Document and report construction requirements,
- Report wastes received monthly,
- Report soil cover applied, especially interim, long term and final,
- Report leachate disposal,
- Report monthly volume of wastes by source for residual and special wastes landfills; weight by source for contained and C/D/D landfills,
- Re-vegetate, and
- Review regulations, permit and operating plan versus actual operations.

### **Annually:**

- Evaluate fill progress,
- Evaluate costs per ton,
- Determine remaining life volume, and
- Submit survey on remaining landfill life. For contained landfills, determine the compaction rate.

### **Importance of Compaction Rate**

One of the most important checks for a landfill manager involves maximizing the waste compaction rate for the site. For example, the difference between 1,100 to 1,200 lbs/cu yd of garbage density over a 1,000,000 cu yd site which has a \$25 per ton tipping fee results in an additional gross profit of \$1.25 million without construction of additional airspace. Another way to look at the savings is at 500 tons per day of incoming wastes, a four month postponement for construction of the next cell.

### **Personnel Management**

To secure and retain competent employees, the facility must have a systematic personnel management plan, including:

#### **A job description for each position listing:**

- Administrative tasks such as:
  - ✓ Management,
  - ✓ Accounting,
  - ✓ Billing,
  - ✓ Engineering, and
  - ✓ Word processing/filing.
- Operating tasks including:
  - ✓ Weighing,
  - ✓ Maintaining equipment,
  - ✓ Operating equipment,
  - ✓ Spreading,
  - ✓ Compacting,
  - ✓ Excavating,
  - ✓ Hauling,
  - ✓ Road maintenance,
  - ✓ Dust control,
  - ✓ Traffic routing,
  - ✓ Vector/litter control, and
  - ✓ Site security.
- Determine how many employees are needed (depends on size of operation),

- Interview and evaluate potential employees, and
- Hire and train employees.

Employees should thoroughly understand work rules, benefits and procedures for reprimands and grievances.

**Training programs** should emphasize the overall operation of the landfill and should include:

- Conditions of the facility permit and plans in relation to job function,
- Operational requirements and methods,
- Daily equipment maintenance,
- Importance of small tasks in accomplishing the overall objectives, and
- Safety training and emergency procedures.

### **Communication: Employees**

Effective communication is a necessary skill for the manager. This is one of the keys to having an operator do a good job.

To have it, the manager must:

- Be aware of attitudes, habits and performance,
- Have patience,
- Don't assume,
- Motivate,
- Recognize (compliment for job well done),
- Make opportunities for advancement, and
- Reward.

### **Involved Parties in Landfill Management**

Proper management of a landfill requires the effort and cooperation of many people. In order for the permitted disposal system to achieve the goal of protecting human health and the environment, information must be exchanged among all individuals associated with the landfill. The following is a list of individuals, and their roles, involved in developing and operating a landfill.

**Applicant:** The applicant is the person who applies with the state agency for a solid waste site or facility permit.

An applicant may be:

- an individual,
- government agency or subdivision (i.e., federal or state agency, fiscal court, KRS 109 Board, city council),
- company (i.e., corporation, partnership, firm), commission trust, or
- interstate body.

**Consultant:** The engineer and geologist hired by the applicant to design the landfill must develop technical plans or drawings based on the geologic and hydrologic characteristics of the site that reflect, where applicable, local, state, and federal requirements. The engineer should be consulted during all phases (e.g. permitting, construction, operation and closure) of the site.

**Local Governing Body:** Counties are required to prepare and revise solid waste management plans as necessary. Permit applications must be consistent with these plans and local regulations or zoning ordinances.

**Federal Government:** The permittee must comply with federal law including: The Wild and Scenic Rivers Act, The National Historic Preservation Act, The Endangered Species Act, The Fish and Wildlife Act, The Clean Air Act, and The Clean Water Act.

**Permit Reviewers:** The Division's permit reviewers include both engineers and geologists, who carefully check the contents of a landfill application to determine that the site meets regulatory requirements. A construction inspection, including testing, is also completed prior to issuing a permit.

**Inspectors:** Inspectors for the Division of Waste Management located in 10 offices throughout the state inspect each landfill approximately once per month to check the daily and long term operation. Inspections of the site are also completed prior to issuing a re-permit, or closure. A list of field offices and the counties they cover in the Appendix of this manual.

**Permit Holder:** Permits are issued in the name of the applicant. The permit holder may manage and operate the landfill or hire an individual(s) for these responsibilities. The permit cannot be transferred without written approval from the Division. If a landfill is sold or leased prior to closure, the successor is required to submit an application, and be financially responsible for closure.

**Landfill Manager:** The landfill manager is the individual with primary responsibility for management and operation of the site. Since the manager monitors the site to assure compliance with all permit conditions, the manager must have an understanding of the site's permit including the engineering plans. The manager makes long range decisions about the landfill and must communicate to the operator and permit holder the things that must be done to keep the landfill in compliance with applicable laws and regulations. This course will enable the manager to read and interpret the permit and provide guidance to both the landfill operator and permit holder.

**State Agency:** The Division of Waste Management is the primary state agency designated to regulate landfills. Division staff review applications for and issue/deny landfill permits. This consists of a review of the design and operational standards proposed, a past performance review of the applicant, and the relationship of the proposed facility to the local solid waste management plan. The Division also inspects landfills to monitor compliance with solid waste management regulations. Construction permits for landfills may be issued for up to 5 years. Initial operating permits are normally issued for 5 years upon completion of construction.

**Landfill Operator:** The landfill operator is the person responsible for the daily operation of the landfill including: cover, compaction, monitor incoming wastes, safety, etc. The operator should be able to identify problems as they arise and report them to the landfill manager. Operation of a landfill is discussed in detail in the Operating Your Landfill Section of this manual.

**Citizens:** Citizens are clients of the landfill and can be the most vocal critics of its operation. A properly operated landfill will cause fewer complaints from citizens who live nearby. A strong citizen education program will promote a better understanding of the usefulness of a landfill and alleviate many fears associated with its operation.

### **Communication: Public Relations**

Public relations is one of the manager's most important functions. Solid waste disposal sites represent an extremely emotional issue, particularly to those who live in the vicinity of a site. Many sites are acceptable from an environmental control aspect, but are vigorously opposed by citizens who associate them with old fashioned open dumps with bad odors, flies and rats. However, through explanation and education the public can be convinced of the advantages.

Public information should stress that:

- Waste is covered daily,
- Access is restricted,
- Insects and rodents are controlled,
- Open burning is prohibited,

- Monitoring controls exist (groundwater, surface water, methane gas),
- Liner requirements exist, and
- Mechanisms exist for local government to hire an enforcement officer to monitor the site.

In addition, the benefits of the post closure use of the site (park, playground, golf course, etc.) should be emphasized.

The media resources available to the manager includes:

Newspapers	Collection vehicles
Billboards	Garbage haulers
Radio	Billing receipts
Television	Elected or appointed officials

There are a few tips for handling complaints from the public:

- Listen to the complaint and get all details,
- Repeat the message to confirm your understanding,
- Explain your company's position and policy,
- Tell the customer what will be done and when,
- Handle complaints quickly,
- Follow through to be sure the complaint is solved,
- Confirm the complaint has received a satisfactory response and thank the customer,
- Inform public of services, your responsibilities and theirs,
- Be professional when handling the public and they will do the same,
- Honesty is best policy when interacting with the public, and
- Don't demand respect; respect is not given it is earned.

### **Facility Operation**

Citizens of the community are your customers. For this reason, there are several factors you must consider when scheduling operations:

- Community needs,
- Labor scheduling,
- Incoming waste quantity,
- Time needed to accomplish tasks,
- Neighbors and effect of the operation on them, and
- Season.

Hours of operation are a permit condition and must be consistent so people will know when the facility is open. In addition, the Division must be notified of any change in hours.

### **Facility Appearance**

First impressions are the most lasting. Cluttered and unorganized looking facilities portray the image of a shoddy operation. On the other hand, neat, well organized facilities give the general public confidence in your operation, thus resulting in few complaints. Items that can assist with giving an organized appearance include:

- Facility sign,
- Traffic signs to the working face or unloading area,
- Mowed grass,
- Neat entrance and facilities,
- Well organized salvage areas, and
- Other operational consideration such as litter, odors, insects and rodents.

### **Compliance Monitoring**

#### **Inspections:**

- Routine inspections are conducted every 4 to 6 months by the Cabinet,
- Operators are not notified in advance,
- Inspection form,
- Photographs are used to document findings and sampling is conducted as needed,
- Finding are discussed with operator after inspection,
- Inspector mails the final inspection later after supervisory review, and
- If no violations are observed, no further action is taken.

**Violations** are marked and described on the inspection report. The violations noted are documented on a Notice of Violation (NOV), which outlines remedial measures and compliance dates. A follow-up inspection is performed to determine if the violation was corrected by the

specified date. Depending on the severity of the violation, the case may be referred for enforcement action or considered as resolved.

**Enforcement:**

- Violations may be referred to the Enforcement Branch for further action,
- If so, an Agreed Order may be drafted and forwarded to permittee,
- Owner or operator may sign the Agreed Order or request a meeting,
- Meeting is held and terms of the agreement are discussed. Agreed Order is forwarded to permittee for signature, and
- **Penalties are assessed in the Agreed Order:**
  - ✓ If the permittee does not comply with the Agreed Order, the case will be referred for an administrative hearing, or
  - ✓ For serious or continued violations, the Division may seek an injunction to close the landfill through Franklin Circuit Court.

### **Landfill Closure Process**

The closure of a landfill is a process that is intended to achieve an environmentally acceptable and stable condition. The owner or operator must begin closure in those areas that have received final waste within 30 days.

The process involves the following actions:

- Stop taking waste in the area to be closed,
- Re-grade for positive drainage, future settling and erosion control,
- Place final cover,
- Fertilize and seed cover,
- Have site inspected,
- For C/D/D landfills: once grading and cover depth are acceptable to the Cabinet, machinery may be removed from site (401KAR 48:060 section 3(1)(e)),
- Apply erosion control measures,
- Establish vegetative cover,
- Request inspection to start closure and post closure periods:
  - ✓ Contained landfill: 2 year closure and 30 year closure care (post closure),
  - ✓ C/D/D: 2 year closure,
  - ✓ Residual: 2 year closure, and



✓ Special waste: 5 year post closure.

- Maintain site for required period,
- Request final inspection,
- Modify deed notice to warn purchasers of disposed wastes, and
- Request release of site and any bonds.

### **Management Practices for Involved Agencies**

Solid waste requires both short and long term management by local and state agencies as well as private industry.

Management practices include:

- landfilling,
- local solid waste management plans,
- source reduction,
- recycling,
- collection,
- incineration,
- resource recovery, and
- public education.

### **Solid Waste Management Planning**

KRS 224.40-315 requires counties to develop and implement a solid waste management plan that shall be updated every five years. The first five year plan for each county began in 1992; the second five year plans are effective for the period of 1998-2002. The governing body, in most instances the fiscal court of a county, is responsible for implementing the solid waste management plan, submitting a completed annual report and responding to local determination requests.

Each plan must address the following components and demonstrate the tasks the county will implement for each component on an annual basis:

- collection of municipal solid waste,
- disposal,
- recycling/reduction,
- cleanup of litter and open dumps,

- enforcement of local and state laws regarding solid waste management,
- siting of solid waste management facilities, and
- educational efforts for schools and the public at large for all components.

**Source Reduction** is normally practiced at the corporate level to reduce the amount of waste having to be managed. An example of source reduction would be for a manufacturer to eliminate extra packaging around their products, design the product to be more durable (e.g., refillable lighters vs. disposal lighters), or to eliminate a toxic chemical from the manufacturing process. This slows the depletion of natural resources, prolongs the life of disposal facilities, and can make incineration and landfilling safer by removing toxins. While local waste handlers do not use source reduction for managing waste that is collected, it is a technique everyone can promote through selective buying habits (purchasing products which can be recycled).

Using 1993 as a baseline year, the 1991 Kentucky General Assembly passed legislation aimed at reducing the amount of waste going to Kentucky landfills by 25 percent. This goal was to be met by 1997; however, because of the increased collection of solid waste and the initiative to cleanup open dumps across the state this goal has not been met. This initiative identified literally thousands of open dumps located across the state. In turn, this has led to a massive cleanup that still continues today.

**Recycling** is the separation of a given waste material (e.g., glass, plastic, aluminum, etc.) from the waste stream and processing it to be used again as a raw material. Recycling can also be viewed as a profit making venture, an avoided disposal cost, and/or a way of preventing potentially useful materials from being burned or buried. Operators are familiar with the types and quantities of waste placed in the working face. This provides the landfill's management and operators with the opportunity to identify large amounts of similar wastes (e.g., wood pallets, slightly damaged products, tires, etc.), separate out these items, and sell them or recommend to the generator that they be removed from the waste stream.

**Collection:** One of the major goals in development of a solid waste management plan is to increase residential collection. Rural collection is low in many counties, but gains are being made as a result of increased attention to the problem. In 1983, door-to-door collection was available to two-thirds of Kentucky's residents by 1985, collection was made available to 73 percent of the residents. 120 counties have now implemented universal collection systems. This means that access for collection of waste is available to all citizens. Currently 26 counties have mandatory collection of their solid waste.

Types of door-to-door collection systems include:

- private haulers,
- permit haulers,
- franchise haulers,
- municipally owned systems, and

- can include staffed convenience centers or transfer stations

Door-to-door collection systems utilized by counties are defined as follows:

- **Private hauler** - No permit required; hauler may provide service throughout the area.
- **Permit Local** - Government requires haulers to obtain a permit in order to operate in the county. Permit haulers may also provide service throughout the county.
- **Franchise** - The county awards a franchise to hauler(s) based on a winning bid. Franchise areas can include one or more designated areas of a county.
- **Municipal** - A collection system that is owned and operated by county government.
- **Convenience Centers/Transfer Stations** - Can be used as a direct haul collection system in conjunction with any of the preceding collection systems or can be used as the only system.

**Universal collection** is defined as "a municipal solid waste collection system that is established by ordinance, is approved by the Energy and Environmental Cabinet (Cabinet) and requires access for each household or solid waste generator in a county."

**Incineration** is the controlled burning of waste in an engineered structure and is useful in reducing the bulk associated with solid waste. Although not risk free, a state-of-the-art incinerator that is well operated should not present a risk to human health and the environment. The Cabinet's Division for Air Quality and Division of Waste Management regulate incinerators. Residual ash from incinerators is regulated by the Division of Waste Management and must be disposed of at a permitted contained landfill.

**Resource recovery** is a treatment process in which the energy produced (heat) from burning the waste is used to produce steam for heating or the production of electricity. The permitting is identical to incineration. Resource recovery has not yet become a viable alternative for waste management in Kentucky. Waste-to-energy projects are often unable to compete economically with landfill operations for the following reasons:

- capital cost (minimum of \$3.5 million for a 50 ton per day plant),
- lack of long term secure markets for energy produced,
- low population,
- incomplete collection systems, and
- the low market price for coal which has about the same BTU value.

TDF (Tire Disposal Facility): Kentucky generates 5 million tires per year. One utility in western Kentucky is burning tire fuel, or chipped tires. This used 1 million tires per year. Two more potential sites in northeast Kentucky would use the rest of the scrap tires. The permitting is the same as incineration and resource recovery.

**Landfilling:** The solid waste management program was initiated by Kentucky in 1968 and permits for disposal were issued shortly thereafter. In 1983, Kentucky had 97 landfills, however, due to noncompliance with state regulations and exhaustion of landfill space, the state now has only 27 contained landfills that will accept Municipal Solid Waste (MSW). These numbers are subject to change due to changes in permit status and new permit applications. The siting of new landfills is difficult in Kentucky due to:

- karst terrain,
- high rainfall,
- high groundwater,
- steep terrain, and
- public opposition

Landfills will continue to be the primary method of solid waste disposal for the foreseeable future. Kentucky currently depends 100 percent on land disposal of its solid waste. While recycling, resource recovery, and incineration of solid wastes will reduce the volume of waste, landfills will still be needed for disposal of incinerator and resource recovery ash and waste not diverted from the process. The increasing cost of landfill construction and operation will encourage the development of larger landfills to meet multi-county and regional needs.

## **CHAPTER 10**

### **CONTAINED LANDFILL**

#### Chapter 10 Behavioral Objectives

1. Identify the types of waste that are acceptable for contained landfills.
2. Understand the minimum design standards for a contained landfill.
3. Define possible solutions to address problems with illegal discharges.
4. List methods of operations.
5. Explain what is can be done to protect the liner of a newly constructed contained landfill.
6. List final cap components and their purpose.
7. Describe the closure of a landfill and its closure requirements.
8. Identify what must be done by the owner following closure of a designated unit.
9. Explain the landfill gas regulations for a closed landfill.
10. Comprehend the leachate regulations.
11. List the types of cover and when it should be used.
12. Comprehend the regulations relating to random inspections.
13. Comprehend the regulations requiring specially designated handling areas.



## CHAPTER 10

### CONTAINED LANDFILL

This section discusses the acceptable waste, design requirements, and the gas and leachate regulations for a Contained Landfill.

#### **Types of Waste that can be Taken**

A list of common acceptable waste streams for contained landfills can be found in 401 KAR 47:080, Section 2(1). Acceptable waste streams include the following:

- All **non-hazardous solid wastes** including household, commercial, institutional, industrial, municipal and C/D/D waste.
- **Properly processed tires:** shredded, quartered, or equivalent.
- **Household hazardous wastes:** leftover or unwanted commercial products used in the home that have the same hazardous properties as regulated industrial hazardous wastes. This means they can ignite or catch fire; react or explode when mixed with other substances; irritate or burn skin; or, they are toxic and can adversely affect human health.

The wastes:

- ✓ can include paints, pesticides and herbicides, solvents, caustics, etc.,
  - ✓ are not regulated as hazardous waste when generated by households,
  - ✓ have the potential to pollute air and water when disposed improperly, and
  - ✓ may be disposed of in contained landfills or recycled.
- **Asbestos containing waste:** Asbestos-containing wastes can be generated from manufacturing, fabricating, demolition, renovation, and spraying operations. Any exposure to airborne asbestos particles for even a short amount of time increases the risk of adverse health affects. The Division regulates the removal and handling of asbestos, before disposal, for Air Quality. Outlined below are the regulatory requirements relative to the treatment and disposal of asbestos containing material (ACM).
    - ✓ must obtain specific written approval by the Cabinet to accept,
    - ✓ should accept early in the day so that ACM will be at the bottom of the lift or dig hole in waste and bury,
    - ✓ must be wetted down, placed in 2 (6 mil.) plastic bags and sealed in rigid containers before transporting to the landfill. Either fiber or metal drums are acceptable,

- ✓ when ACM wastes are not transported in sealed rigid containers, the transporter must have a written waiver from the Division for Air Quality; bags of ACM waste should not be accepted without a written waiver,
  - ✓ drums and bags must be marked with a caution label,
  - ✓ do not allow trucks containing ruptured bags to unload, and drums must be handled and disposed of in a manner that prevents breaking open containers during unloading and covering
- **Sludges:** defined as solids, semi-solids or dusts generated by wastewater treatment units and air pollution control devices.
    - ✓ must obtain specific written approval by the Cabinet to accept,
    - ✓ testing is necessary to verify a sludge is not a hazardous waste (TCLP),
    - ✓ must be dry or pass the paint filter test (method of testing for free liquids), and
    - ✓ may be treated before disposal at the landfill to remove free liquids (belt press, drying beds, etc.).
  - **Conditionally Exempt Small Quantity Generator Hazardous Waste:** people who generate less than 220 pounds of hazardous waste per month are conditionally exempt small quantity hazardous waste generators. These wastes may be disposed of in contained landfills provided that the owner or operator:
    - ✓ obtains specific approval by the Cabinet, and
    - ✓ ensures that the waste passes the paint filter test.
  - **Contaminated Soils:** During the clean up of spills and releases, contaminated soil and other debris may be generated. One of the most common sources of this waste is soil generated during the removal of underground storage tanks.
    - ✓ **Do not** accept any contaminated soils unless you know the source of contamination and the soil has been analyzed to demonstrate it is not a regulated hazardous waste.
    - ✓ PCB spills of oils containing less than 50 ppm PCB may be disposed of at a contained landfill.
    - ✓ Petroleum contaminated soils, generated during the removal of underground storage tanks, are not a hazardous waste; however, other gasoline-contaminated soils must be tested for hazardous waste determination.



- ✓ Contaminated soil can be used as daily cover only if benzene concentration is less than 1 ppm and material is not applied during a precipitation event.
- **Any other wastes listed as acceptable in the landfill permit**

### **Design Requirements**

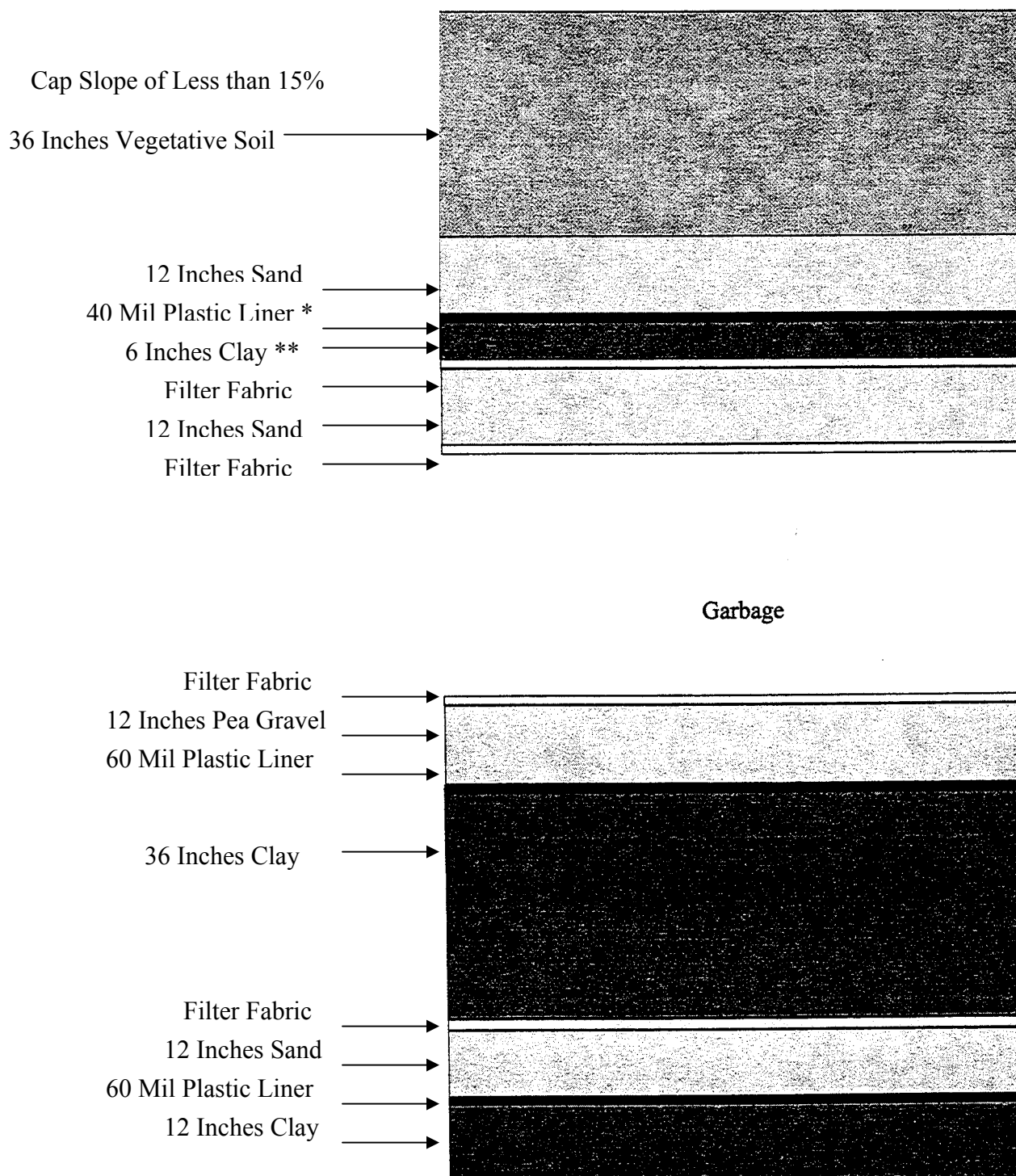
Design requirements for contained landfills are outlined in 401 KAR 48:070 and 48:080. These chapters outline the minimum design standards for the liner and cap. Owners or operators must ensure that the narrative and design:

- Maintains the separation of surface water and leachate. The contours of the landfill must minimize the surface water that runs on or through the landfill,
- Allows ditches to withstand a 100 year, 24 hour storm flow (runoff from a 6 to 7 inch rainfall),
- Meets the following requirements for sediment basins:
  - ✓ The emergency spillway must pass a 100 year, 24 hour storm event without over flowing,
  - ✓ The storage and principal spillway discharge must not flow into the emergency spillway (ditch that carries water that would have washed away the dam) during a 25 year, 24 hour storm event (rainfall of 4 to 5 inches),
  - ✓ The pond must have a one year sediment (silt) storage volume,
  - ✓ The flow must have verification by the unit hydrograph method of calculation, and
  - ✓ The downhill toe of the slop of the sediment pond dam must be 50 feet from the property line
- Enables the landfill to resist the maximum anticipated horizontal acceleration in lithophytic material if it is constructed in the seismic impact zone,
- Ensures the stability of the system components (i.e., liner, leachate collection system, cover) for landfills located in unstable areas (i.e., karst, underground mines, unstable slopes),
- Ensures that sufficient equipment be onsite to compact wastes received within 2 hours. Backup equipment must be available within 24 hours. A recordkeeping system must be proposed to address equipment maintenance.

- Ensures an in-place waste density of at least 1,200 pounds per cubic yard,
- Addresses soil availability to meet the liner and cap construction needs (clay volumes and permeability),
- Includes a building for personnel which is:
  - ✓ Heated
  - ✓ Air-conditioned or screened, and
  - ✓ Potable water and sanitary facilities.
- Includes a building which is large enough to hold the largest piece of equipment for maintenance,
- Ensures that each building has a monitoring alarm system to detect explosive gases,
- Outlines a quarterly methane monitoring program which addresses:
  - ✓ The control of explosive gases per EPS of 401 KAR 47:030,
  - ✓ Soil and water properties of the area around the landfill,
  - ✓ Location of facility structures and boundaries,
  - ✓ Gas venting system with minimum of one vent per acre, and
  - ✓ Location of surrounding off site structure and residences.
- Meets the following roadway requirements:
  - ✓ Construction of a road from the publicly maintained highway to the waste disposal area,
  - ✓ Construction of an all weather perimeter road (gravel or paved) around the landfill to each monitoring and sediment control structure,
  - ✓ Internal roads must be all weather and designed to within 200 feet of the working face,
  - ✓ All roads must be designed wide enough to allow passage of vehicles, carry normal traffic, and properly drain, and
  - ✓ Entry to landfill must have enough space to safely accommodate trucks and prevent delays on the public roadway (include stacking lanes).

- Has a safety and communication plan which addresses:
  - ✓ Heavy equipment safe operation and maintenance to prevent accidents and breakdowns, and
  - ✓ Description of:
    - Communication equipment such as radios, mobile phones and base telephones,
    - Fire fighting procedures, and
    - OSHA related requirements.
- Has scales to weigh all waste,
- Has an adequate:
  - ✓ Tank storage based on predicted leachate volumes,
  - ✓ Method of leachate measurement,
  - ✓ Liquid removal schedule, and
  - ✓ Treatment method
- Has a liner containing (starting from the bottom and going up):
  - ✓ A sub-grade: the landfill sub-grade is the upper rock layer, soil layer, or select fill that is the foundation to support the liner. This sub-grade must be:
    - Graded according to plan,
    - Sufficiently dry and stable,
    - Free of organic material, and
    - Verified by a minimum of 9 tests per acre to determine sub-grade compaction. Sufficient cross sections must be taken to document the finished elevation.
  - ✓ For any areas of less than 10 percent slope, a secondary composite liner, which must consist of:
    - A 12 inch thick clay layer with a permeability of  $1 \times 10^{-7}$  cm/sec (i.e. takes ten years for one foot of water to penetrate),

- Synthetic liner with a nominal thickness of 60 mils (a mil is one thousandth of an inch),
  - A 12 inch drainage layer with a permeability of  $1 \times 10^{-3}$  cm/sec (sand), and
  - Filter fabric
- ✓ For all area, a primary composite liner with:
- A 36 inch thick clay layer with a permeability of  $1 \times 10^{-7}$  cm/sec,
  - A 60 mil thick synthetic liner,
  - A 12 inch drainage layer with a permeability of  $1 \times 10^{-3}$  cm/sec (sand),
  - A filter fabric to protect the drainage layer,
  - Geonet composite, a synthetic drainage netting glued to upper and lower filter fabrics, may replace the drainage layer on slopes greater than ten percent, and
  - Geosynthetic Clay Liner (GCL) on two foot thick clay sub-grade may replace the 36 inch Compacted Clay Liner (CCL).
- ✓ A leachate collection system that uses:
- A maximum static head of 12 inches of depth,
  - Eight inch diameter schedule 80 plastic pipe for the main collection lines or another design that meets the 12 inch maximum leachate depth rule,
  - Four inch lateral lines installed perpendicular to flow or another design that meets the 12 inch maximum leachate depth rule,
  - A design for the pipes to withstand all encountered static and dynamic load (dead and live loads),
  - A one percent minimum slope for piping,
  - A leachate collection tank with 1,000 gallons plus 15 days at peak production rates during operation or closure (using the HELP Model),
  - An identified and assured disposal method (letter of acceptance from an off site Publicly Owned Treatment Works (POTW)), and
  - Allowances for inspection and cleaning.

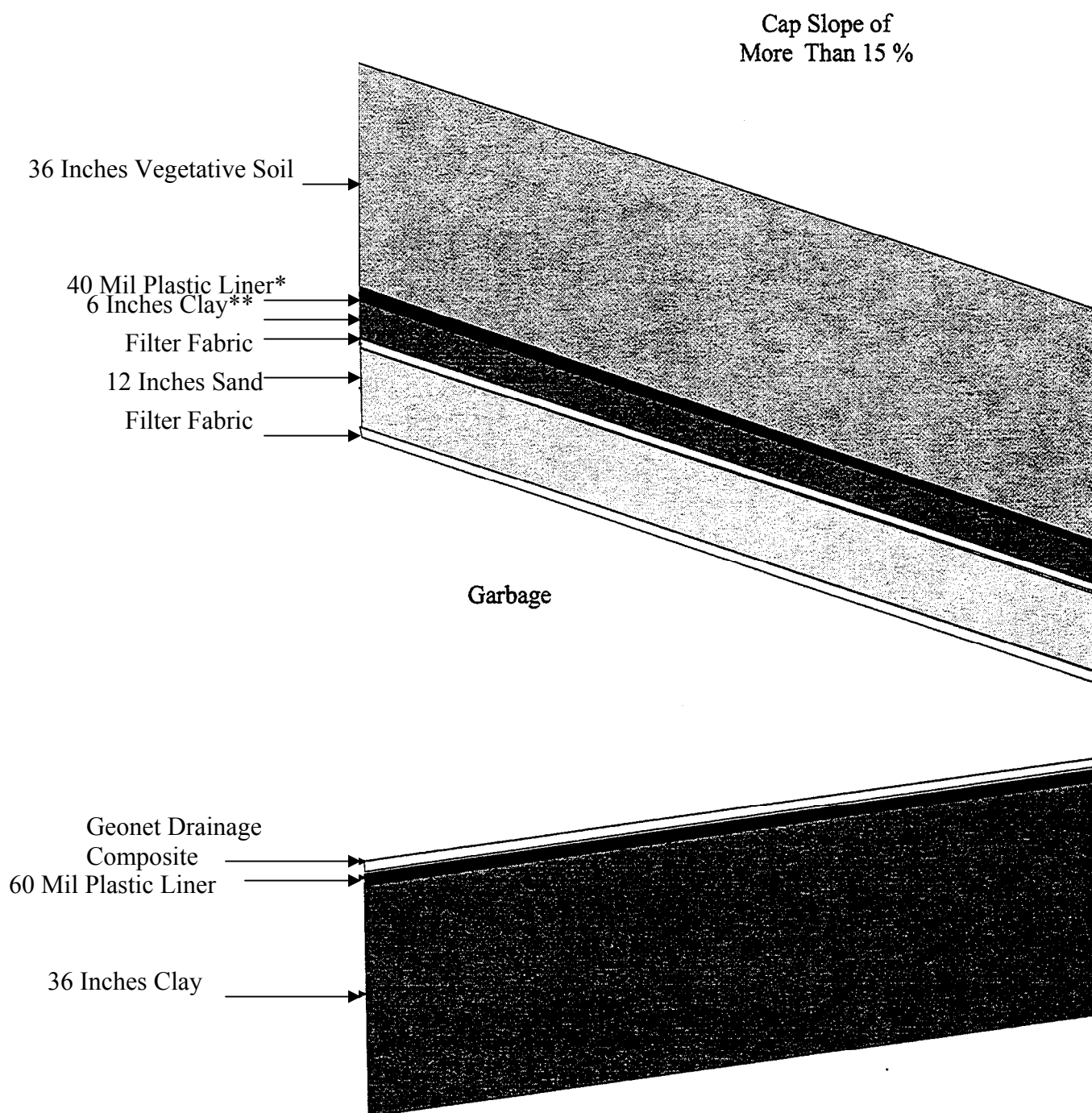


\* Required when plastic present in bottom liner

\*\* Required by Cabinet

**Figure 4-2a**  
**Contained Landfill Design**  
**Cross Section Flat Areas**

Liner Slope of  
Less than 10%

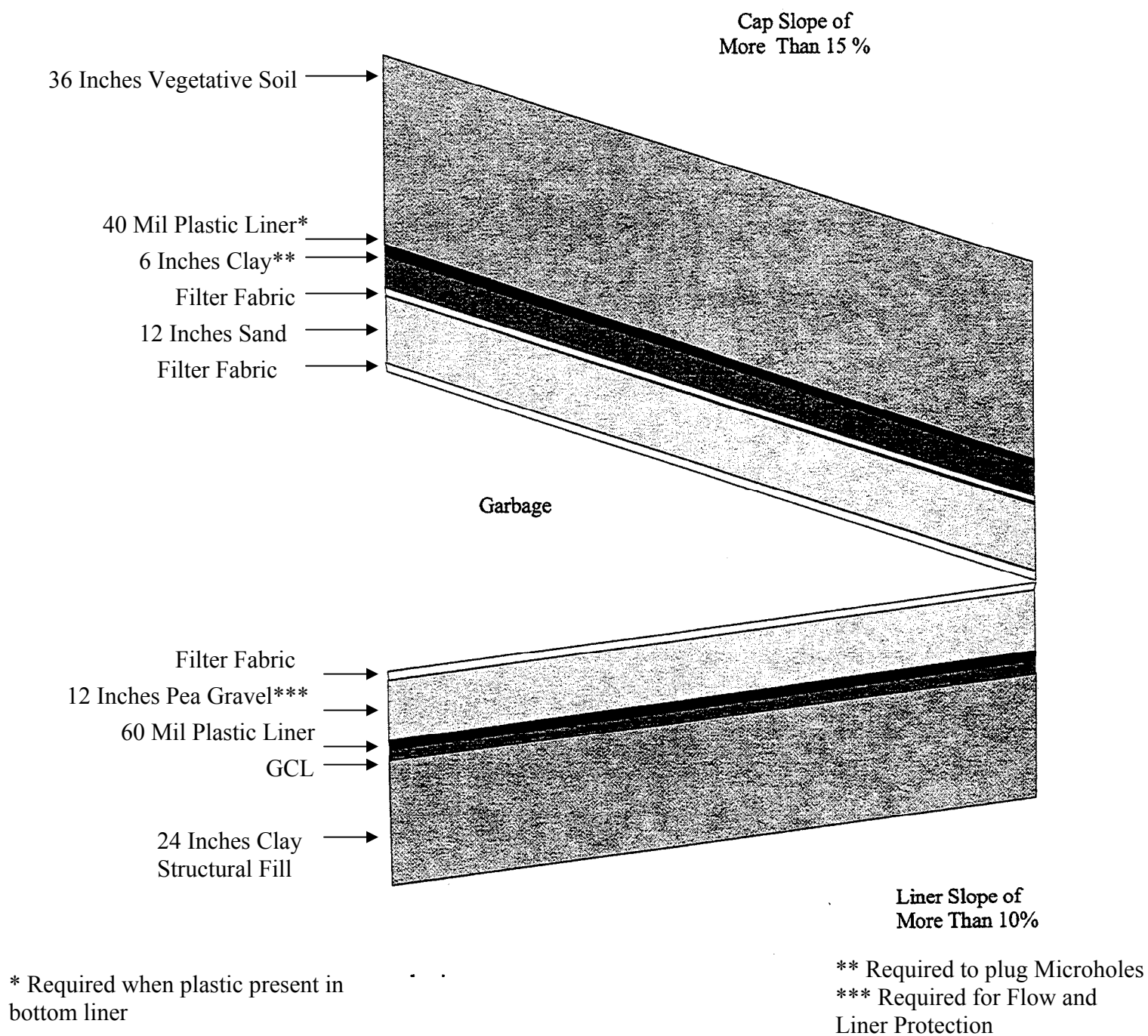


\* Required when plastic  
present in bottom liner

\*\* Required by Cabinet

**Figure 4-2b**  
**Contained Landfill**  
**Design Cross Section**  
**Sloped Areas**

Liner Slope of  
More than 10%



**Figure 4-2c**  
**Contained Landfill**  
**Design Cross Section**  
**Geosynthetic Clay Liners (GCL)**

The recent past has documented several problems with the design and operation of leachate collection systems at contained landfills. Failure to divert rainfall run-on and runoff away from the leachate collection layer overloaded the systems with rainwater and dilute leachate that nevertheless must be transported to a POTW for disposal (similar to mixing storm water and sewage). This results in an enormous increase in hauling and treatment costs or increases temptation to directly discharge to a stream. One company performed an open dump clean up work over one million dollars in response to illegal discharges. Solutions include:

- The design and installation of plastic liner flaps between the new liner area and the current disposal area,
- Construction of a smaller cell since plastic encourages runoff (one year maximum is recommended),
- Installing partial berms between cells to separate leachate flows from filled area from surface water in new areas,
- Covering the entire new cell with waste and interim cover while directing rain water (runoff) from the top of the interim cover through the sediment pond,
- The design and installation of a drain pipe through the “dam” at the bottom of the landfill for storm water gravity flow (less expensive than pumping but must seal prior to filling),
- The design and installation of temporary runoff ditches from the covered working area to the main runoff ditches connecting to the sediment pond (Designed by a Professional Engineer per 401 KAR 48:070 section 7(2)(C)), and
- Partnering the consulting engineer and the manager to sequence filling, i.e., onsite visits to look at the current situation and plan a way out for the storm water as filling progresses.

## **METHODS OF OPERATION**

- Prepare line,
- Plan to deposit refuse at bottom of slope for best control of surface water and blowing litter,
- Prepare a waste dumping berm high enough for the protective layer and first waste layer,
- Spread refuse using light weight equipment (such as a D-5 or equivalent), and
- Continue placing next lift normally using a landfill compactor.



## LINER PROTECTION

The Cabinet requires protection of the newly constructed contained landfill liner to prevent boards, pipes and other potentially damaging material from puncturing the plastic and clay system. This is even more important as more designers specify GCL and geocomposite drainage netting instead of CCL and one foot of gravel. The new clay material, while much more resistant to water infiltration, is much thinner than the traditional clay liner. The GCL is typically less than one-half inch thick compared to the thirty-six inch thick normal liner. The drainage net is also much thinner.

The options for GCL/geonet liner protection include:

- Placing six to twelve inches of sand or gravel on top of the GCL/drainage net,
- Placing eight feet of “fluff” free of any damaging objects, such as boards or pipes, on top of the twelve inch thick drainage layer or sand/gravel protective layer. This may require:
  - ✓ Route management so that haulers pick up none of these objects during fluff layer placement,
  - ✓ Diversion of C/D/D waste trucks to the C/D/D landfill unit,
  - ✓ Spotters to remove objects on the floor of the cell to remove damaging objects, and
  - ✓ Use of a D-5 or equivalent or smaller equipment for spreading.

## FINAL CAP

The cap is a layered system which must maintain a slope between five and twenty-five percent. The components of the cap are (from bottom to top):

- Filter fabric,
- Twelve inch thick sand gas venting system with a minimum hydraulic permeability of  $1 \times 10^{-3}$  cm/sec,
- Filter fabric to protect the venting system,
- Eighteen inch thick clay layer with a minimum permeability of  $1 \times 10^{-7}$  cm/sec,
- For areas with a slope of less than fifteen percent, a twelve inch thick drainage layer with a permeability of  $1 \times 10^{-3}$  cm/sec sand, and
- A thirty-six inch thick vegetative cover.

**Reference Figure 4-2 for a drawing of the minimum liner and final cap design for a contained landfill.**

### **Closure and Closure Care Requirements**

The owner is required to prepare a closure plan as part of the technical application, which describes all the necessary steps to close all units of the landfill and provide maintenance. This plan must identify:

- Methods, procedures, and processes to close each unit in accordance with the:
  - ✓ Environmental Performance Standards of 401 KAR 47:030,
  - ✓ Groundwater rules of 48:300, and
  - ✓ Closure regulations in:
    - 48:070 section 15,
    - 48:080 section 8 through 10, and
    - 48:090 section 13.
- An estimate of the maximum open area or uncapped area for each landfill unit (or phase),
- A schedule for completing closure that includes beginning within thirty days following the final receipt of waste,
- The methods to maintain final cap, including necessary repairs due to erosion, settling, etc.,
- The maintenance and operation of the:
  - ✓ Leachate collection system,
  - ✓ Groundwater monitoring system, and
  - ✓ Explosive gas monitoring system.
- The name, address and telephone number of the contact person for the thirty year closure care period, and
- The description of the planned use of the property.

Following closure of a designated unit, the owner must submit a certification by a professional engineer that the phase has been closed in accordance with the approved plan. A copy of the approved closure plan must be kept onsite until the closure care period has ended. Once the Division has accepted the certification of closure, the owner must alter the deed to notify all potential purchasers of the location and time of operation, type of waste disposal, and caution against future disturbance of the area. Proof of this deed change is required before the Cabinet acceptance of the cap and release of the closure bond.

### **Landfill Gas Regulations**

- **Maintenance Equipment:** The owner or operator shall provide the landfill equipment required to maintain leachate and methane gas systems (401 KAR 48:070, section 6(3)(d)),
- **Buildings:** Each building shall have an alarm installed in accordance with the manufacturer's recommendations to detect the presence of explosive gases (401 KAR 48:070 section 9(3)),
- **Explosive Gas Program:** The application for a contained landfill unit shall include a quarterly methane monitoring program to ensure that the standards of Section 11 of 401 KAR 47:030 are met.

The methane monitoring system shall be developed based on the following factors:

- ✓ Soil transmissivity,
- ✓ The hydrogeologic conditions surrounding the disposal site,
- ✓ The hydraulic conditions surrounding the disposal site, and
- ✓ The location of facility structures and property boundaries.
  - The minimum frequency of monitoring shall be quarterly.
  - A gas venting system shall be designed for all landfills. A minimum of one vent shall be required per acre of landfill to be filled unless otherwise approved by the Cabinet (401 KAR 48:070 section 10; similar to 40 CFR 258.23).
- **Closure:** The operator of a contained solid waste landfill shall close each landfill unit and phase in a manner that minimizes the need for further maintenance and minimizes the closure care formation and release of leachate and explosive gases to air, groundwater, or surface water to the extent necessary to protect human health and the environment as required by 401 KAR 47:030 and 401 KAR 48:300 (401 KAR 48:070 section 15(1)),

- **Closure Cap:** At a minimum the final cap shall consist of a layered system. Each layer shall have the same slope of between five and twenty-five percent. The 995-control components, listed from bottom to top, are:
  - ✓ A filter fabric or other material approved by the Cabinet,
  - ✓ A twelve inch sand gas venting system with a minimum hydraulic permeability of  $1 \times 10^{-3}$ , and
  - ✓ A filter fabric or other material approved by the Cabinet (401 KAR 48:080 section 8(1) through (3)).
- **Alternative Specifications:** Alternative specifications may be used only after approval by the Cabinet upon a demonstration by a qualified registered professional engineer that they shall result in performance with regard to safety, stability and environmental protection equal to or better than that resulting from designs complying with the specifications of this administrative regulation (401 KAR 48:080 section 11).
- **Daily Cover Window:** The owner or operator may remove daily cover to facilitate the vertical passage of methane gas and leachate and shall recover the exposed areas within eight hours of exposure,
  - ✓ The owner or operator shall dispose of any daily cover removed under subsection (1)(d) of this section as solid waste.
- **Explosive Gases Control:** The owner or operator shall ensure that:
  - ✓ The concentration of methane gas generated by the facility does not exceed twenty-five percent of the LEL for methane in facility structures (excluding gas control or recovery system components), and
  - ✓ The concentration of methane gas does not exceed the LEL for methane at the facility property boundary.
  - ✓ The owner or operator of a contained landfill shall quarterly monitor for explosive gas at the following locations:
    - Underneath or in the low area of each onsite building,
    - At locations along the boundary as shown in the permit,
    - At each gas passive bent installed under the final closure cap,
    - At any potential gas problem areas, as revealed by dead vegetation or other indicators, and

- At any other points required by the permit.
- ✓ The owner or operator shall record the date, time, location, percent LEL and other pertinent information on the recordkeeping form approved by the Cabinet,
- ✓ The owner or operator shall install, operate and maintain a gas detector with an alarm set at twenty-five percent of the LEL in each onsite building, and
- ✓ If methane gas levels exceeding the limits specified in subsection (1) of this section are detected, the owner or operator shall:
  - Take all necessary steps to ensure immediate protection of human health,
  - Immediately notify the Cabinet of the methane gas levels detected and the immediate steps taken to protect human health, and
  - Within fourteen days, submit to the Cabinet for approval a remediation plan for the methane gas releases. The plan shall describe the nature and extent of the problem and the proposed remedy. The plan shall be implemented upon approval by the Cabinet (401 KAR 48:090 section 4 similar to 40 CFR 258.23(c) and 258.29).
- **Emission guidelines and compliance times:** Section 1, incorporated by reference: (1) 40 CFR 60.30c to 60.36c, (**40 CFR 60, subpart CC**), Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills, as published in the Code of Federal Regulations (CFR), Title 40, Part 60, July 1, 1997, is incorporated by reference (401 KAR 61:036),
- **Risk-based limits for carcinogens** and other harmful elements (Air rule 401 KAR 63:020 and waste rule 401 KAR 47:120 section 2),
- **Title V major source** if one Hazardous Air Pollutant (HAP) exceeds 10 tpy, total HAPs 25 tpy, or any non-HAP 100 tpy. This would require a thirty day public notice (401 KAR 50:035 and 40 CFR 70).

## **Leachate Regulations**

Owners or operators shall design landfills to ensure that: surface water flows and leachate are separated, surface contours minimize surface water running onto or through the operational or completed fill area (401 KAR 48:070 section 2).

- Leachate Storage Tanks: In addition to the requirements set forth in this administrative regulation, 401 KAR 47:180 and 401 KAR 47:190, an application for a permit to construct a contained landfill that includes a tank for leachate storage shall contain:
  - ✓ The estimated volume of leachate to be generated and a proposed system to record actual quantities stored and removed,
  - ✓ A schedule of liquid removal,
  - ✓ A description of the final treatment and disposal of the liquid stored,
  - ✓ A description of the liquid storage facility design,
  - ✓ A method to measure the quantity of leachate extracted or removed and disposed,
  - ✓ A closure plan for the tanks, and
  - ✓ Design criteria to ensure that on-ground, in-ground, underground and above ground tanks are constructed of materials and installed, in such a manner, that the tank system shall contain the stored liquid for the active life of the site to include closure care. A procedure for periodic testing of the tank system shall be employed to assure the tank system does not leak (401 KAR 48:070 section 14).
- The leachate collection tank shall be a minimum of 1,000 gallons. Additional capacity shall be provided to store leachate for a minimum of fifteen days production at peak production rates during operation and closure (401 KAR 48:080 section 6(4)(f)). **Note:** The design engineer and site manager must strive to use the smallest practicable daily working face and area uncovered by one foot of soil interim cover. The fifteen days peak production is obtained from the HELP model, usually for the wettest fifteen day period over the last twenty years. The Cabinet is witnessing the actual production of leachate exceeding the model prediction because:
  - ✓ Large cells sit awaiting trash and water shedding daily and interim cover. The rainfall hits the plastic and flows into the LCS, and
  - ✓ Managers and operators are using larger operating areas than necessary.

- Garbage filling operations start in the worst possible place, where it is difficult, if not impossible, to redirect storm drainage. To correct this problem, managers should:
  - ✓ Talk to the engineer DURING the design phase (sequence of operations),
  - ✓ Talk to the operators and engineer and place interim drainage flaps, ditches and berms inside the current cell to divert storm water away from the working area and LCS, and
  - ✓ Limit the size of the constructed cell to one year of trash (construction mobilization cost is cheaper than leachate hauling and treatment costs).
- The method of leachate disposal shall be described. When it is discharged to the sediment structure, a treatment plant or other method of discharge is proposed, the KPDES permit shall reflect this provision. When an off site wastewater treatment plant is used, the applicant shall provide written documentation showing the acceptance of the waste. The criteria for disposal at the wastewater treatment plant shall be stated. The LCS shall have a method to measure the quantity of leachate managed at the site (401 KAR 48:080 section 6(4)(g)). **Note:** Use the list of test parameters requested by the wastewater treatment plant as the landfill quarterly monitoring list.
- The leachate collection pipe system shall be designed to allow internal inspection, cleaning and maintenance (401 KAR 48:080 section 6(4)(h)). **Note:** This needs more emphasis. It is less expensive to clean pipe than replace it.
- Maintenance and operation of the leachate collection system in accordance with the requirements, if applicable, until leachate no longer is generated (401 KAR 48:090 section 13(1)(a)2). **Note:** This cost must be reflected in the closure care bond.

### **Cover Requirements**

Contained landfills are required to utilize 3 types of cover. The type utilized depends on the amount of time it will be used as a cover for wastes.

**Daily cover** - 401 KAR 48:090, Section 3(1), requires a compacted layer of at least 6 inches of soil to cover all exposed wastes at the end of each operating day; or for continuously operating landfills, once every 24 hours. Primary cover materials are soil, properly weathered or crushed shale or silt stone.

This cover must not allow waste to protrude except for occasional litter not exceeding 10 percent of the cover area. Daily cover must be placed and compacted to allow for proper drainage. The owner or operator may remove daily cover to allow methane gas to escape or for the removal of leachate. Any daily cover removed must be disposed of as a waste.

**Interim cover** - 401 KAR 48:090, Section 3(2) requires the placement of an additional 6 inches of cover material over an area not set to receive additional solid waste within 30 calendar days. Including the previously applied daily cover, this would result in a cover depth of 12 inches. Interim cover should be placed, compacted, and graded to allow proper drainage and should be protected by temporary erosion controls. Interim cover must be properly seeded during the fall seeding season.

Placement of interim cover normally means that the operator will utilize the area for disposal again in the near future. On the day waste is to be placed over an area that has interim cover, up to 6 inches of cover may be removed from the area of the cell for that day's operation.

**Long-term cover** - 401 KAR 48:090, Section 3(3) requires the operator to apply an additional 18 inches of cover over all areas not scheduled to receive additional wastes within 4 months by September 15 of each year. This will increase the depth, including daily and interim cover, to a total of 30 inches. Long-term cover must be placed, compacted, and graded to allow for proper drainage. Erosion controls and proper seeding must be completed during the fall seeding season.

The entire 18 inches of long-term cover may be removed within 7 calendar days of placement of additional wastes. An additional 6 inches of cover may be removed on the day new waste is to be placed in the cell.

Contained landfills are required to record, on a form(s) approved by the Division, the daily cell locations, dates of all cover applications, and certification reports as required by 401 KAR 48:090, Section 3 (5).

### **Random Inspections**

401 KAR 48:090, Section 2 describes the procedures for excluding the receipt of hazardous waste. This section requires random inspections of incoming loads. The purpose of random inspections is to make sure that no hazardous waste enters the landfill with the exception of exempt hazardous waste that falls under 401 KAR 31:010, Sections 4(2)(a) and 5(7)(c)5. These inspections are also helpful in preventing disposal of unauthorized solid waste and free liquids.

While the Cabinet does not have any specific regulations outlining how random inspections should be conducted, the following must be taken into account:

- Random inspections should be documented and kept on file.
- Facility personnel must be trained in hazardous waste identification.
- Upon discovery of a hazardous waste, the owner or operator of a contained landfill must isolate the load and notify the Cabinet immediately.



### **Separate Waste Handling Areas**

401 KAR 48:070, Section 5 requires contained landfills to have specially designated handling areas, away from the working face, to handle certain wastes. Separate areas are required for:

- **Loads** containing burning or smoldering wastes,
- Wastes from pick-up trucks and automobiles, and
- Salvageable and recyclable materials - if the facility intends to manage these materials

Burning or smoldering waste could cause other wastes in the landfill to catch on fire. This creates a dangerous situation for landfill employees, people who are unloading and emergency personnel responding to the fire. It also causes air pollution. An area for these wastes must be designated on the permit.

Separate areas are required for pick-up trucks and automobiles simply because of safety reasons. It can be dangerous for smaller vehicles to unload at the working face because of heavy traffic from larger dump trucks and landfill equipment. An area for these wastes must be designated on the permit.

Because 401 KAR 48:090, Section 9(6) prohibits scavenging within 100 feet of the working face, incoming loads with salvageable and recyclable materials must be taken to an area separate from the working face. This area must be designated on the permit.



## **CHAPTER 11**

### **CONSTRUCTION/DEMOLITION/DEBRIS LANDFILL**

#### Chapter 11 Behavioral Objectives

1. Identify the types of waste that are acceptable for C/D/D landfills.
2. Understand the design requirements for C/D/D landfills.
3. Explain the closure and closure care requirements for C/D/D landfills required by regulation.
4. List what must be included in the design for leachate control and disposal.
5. Understand the operational requirements for Greater than One Acre C/D/D Landfills.



## **CHAPTER 11**

### **CONSTRUCTION/DEMOLITION/DEBRIS LANDFILL**

This section discusses the acceptable waste, design requirements, and the operational requirements for a Construction/Demolition/Debris Landfill.

#### **Types of Waste that can be Accepted**

401 KAR 47:080 section 2(2) lists common acceptable and unacceptable waste streams. Acceptable wastes include the following:

- Any solid waste, which results from the construction, remodeling, demolition or repair of structures and roads.
- Uncontaminated solid waste consisting of vegetation resulting from land clearing and grubbing, utility line maintenance, and seasonal storm related clean up. Such wastes include, but are not limited to:
  - ✓ bricks, concrete and other masonry material
  - ✓ shredded or segmented tires
  - ✓ clean soil and rock
  - ✓ wood
  - ✓ wall coverings
  - ✓ plaster and drywall
  - ✓ plumbing fixtures
  - ✓ tree stumps, limbs, leaves and yard waste
  - ✓ sawdust
  - ✓ paper and paper products
  - ✓ metals
  - ✓ furniture
  - ✓ insulation
  - ✓ roofing shingles
  - ✓ asphaltic pavement
  - ✓ glass
  - ✓ plastics that are not sealed in a manner that conceals other waste

- ✓ electrical wiring
  - ✓ components containing no liquids or hazardous metals that are incidental to any of the above materials
  - ✓ any other inert waste as approved by the Cabinet
- Unacceptable waste includes the following:
    - ✓ waste from an unpermitted geographic source
    - ✓ waste not listed on the permit
    - ✓ waste that does not result from construction, demolition, remodeling or repair of structures or roads
    - ✓ electrical fixtures containing hazardous liquids such as fluorescent light ballasts or transformers
    - ✓ PCB containing waste
    - ✓ hazardous material spill residues
    - ✓ conditionally exempt small quantity generator waste
    - ✓ any hazardous waste regulated by 401 KAR chapters 31 and 32
    - ✓ whole tires
    - ✓ liquids
    - ✓ drums
    - ✓ fuel tanks

### **Design Requirements**

Technical requirements specified for C/D/D landfills are outlined in 401 KAR 48:060. These requirements are the bare minimum of standards that must be met. This means that the design and closure plans submitted must at least meet the following criteria:

- They must be designed to keep surface water flows and leachate separate by:
  - ✓ Minimizing surface water running onto or through the operational or completed fill areas,
  - ✓ Designing diversion ditches and structures for a 100 year/24 hour storm flow (about 6 to 7 inches of rain), and

- ✓ Designing sediment basins (silt pond) and emergency spillways:
  - To retain and safely pass a 25 year/24 hour storm event (about 4 to 5 inches of rain),
  - To pass a 100 year/24 hour storm event (about 6 to 7 inches of rain) through the emergency spillway (ditch to carry the extra water that would have broken the dam) with no flow exceeding the design freeboard (i.e., space between the top of the water and top of the ditch),
  - To allow sediment storage from an operating period of one year (one may use shorter times with a more frequent clean out schedule),
  - With specified sediment basin clean out elevations (i.e., time to remove the soils when the top of the dirt reaches this mark), and
  - Using designs verified by a unit hydrograph method of calculation (an engineering method to calculate flow).
- **Liner and leachate collection systems** must be designed with the following:
  - ✓ The bottom liner, covering the bottom and sidewalls, consisting of:
    - 12 inches of soil, and
    - 12 inches clay with  $1 \times 10^{-7}$  centimeters per second maximum permeability or its equivalent (i.e., ten years for one foot of water to break through the bottom of one foot of clay).
  - ✓ Leachate collection system in areas with a slope of less than 25 percent which:
    - Have a drainage layer of 12 inches of material with a minimum permeability of  $1 \times 10^{-3}$  centimeters per second or its equivalent (i.e. sand),
    - Is designed for a maximum head (standing water depth) of 12 inches,
    - Used four inch diameter, perforated lateral pipes which are:
      1. installed perpendicular (right angles, or  $90^\circ$ ) to flow, and
      2. with the piping layout having a minimum slope of one percent.
    - Uses an 8 inch diameter pipe for trunk lines, and

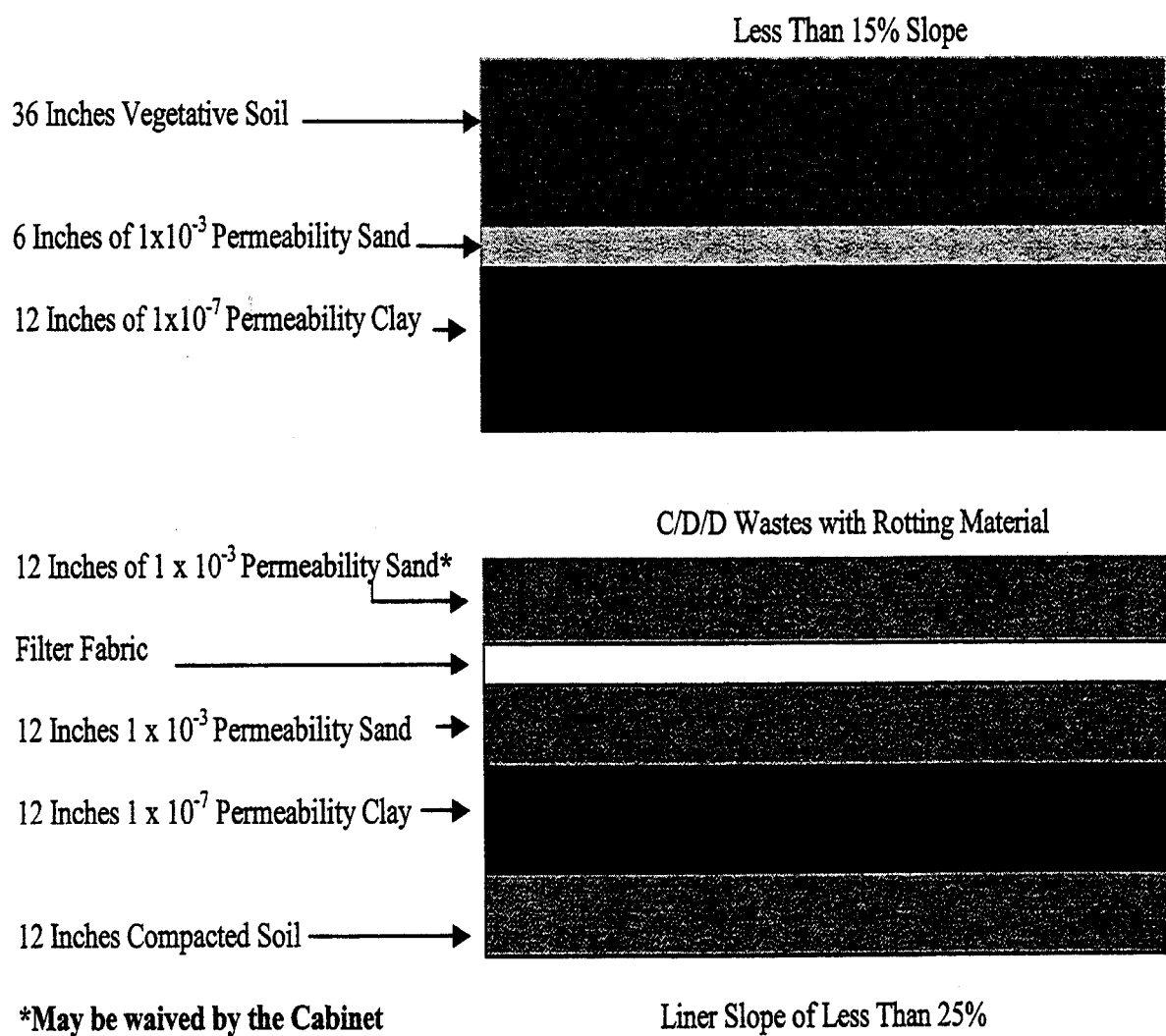
- Has a filter fabric (i.e. cloth) or other material design to protect the integrity of the drainage layer, and a filter fabric protection layer of 12 inches of material with a minimum permeability of  $1 \times 10^{-3}$  centimeters per second or its equivalent (sand). The Cabinet frequently waives these two requirements if the applicant can show equivalent environmental protection (little or not clogging of the sand by the waste constituents).
- The leachate collection tank with 1,000 gallons minimum plus storage volume for fifteen days of peak production capacity during operation or closure using the HELP (Hydraulic Evaluation of Landfill Performance) Model. This is usually the wettest fifteen day period during 20 years of area rainfall data,
- A description of how the leachate will be measured disposed of and documented. If using an off site wastewater treatment plant, provide an approval letter from the owner of the treatment facility,
- Adequate solid material must be documented to provide coverage of one foot of compacted cover at the end of the week or on lifts of 10,000 square feet area, whichever occurs first (for example, if you spread 20,000 square feet of wastes in one week, you must apply cover twice),
- Surface and groundwater monitoring plan which meets 401 KAR 48:300,
- Equipment sufficient to handle waste stream,
- Identify an area for handling hot or smoldering load and other special handling problems, and
- Include a shelter for operating personnel, which has potable water, sanitary facilities, lights, heat and screened windows.

When the applicant restricts the waste to non-putrescible wastes and wastes that will not leach, the liner may be modified to consist of:

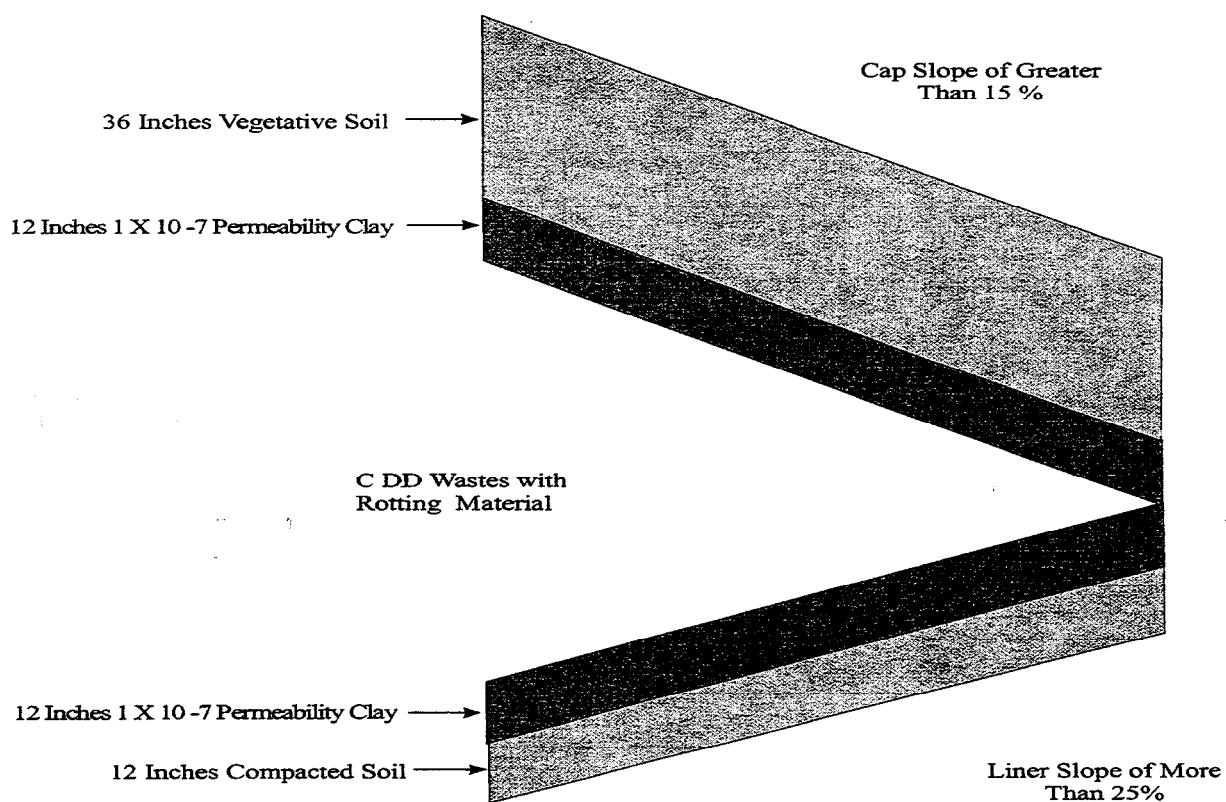
- Two feet of soil re-compacted to 90 percent standard proctor, and
- No leachate collection system.

Non-putrescible means tightly baled paper or cardboard, wood boards, logs, stumps, asphalt, concrete, etc. Putrescible means anything subject to rapid decomposition such as loose paper or cardboard, wood shavings or chips.

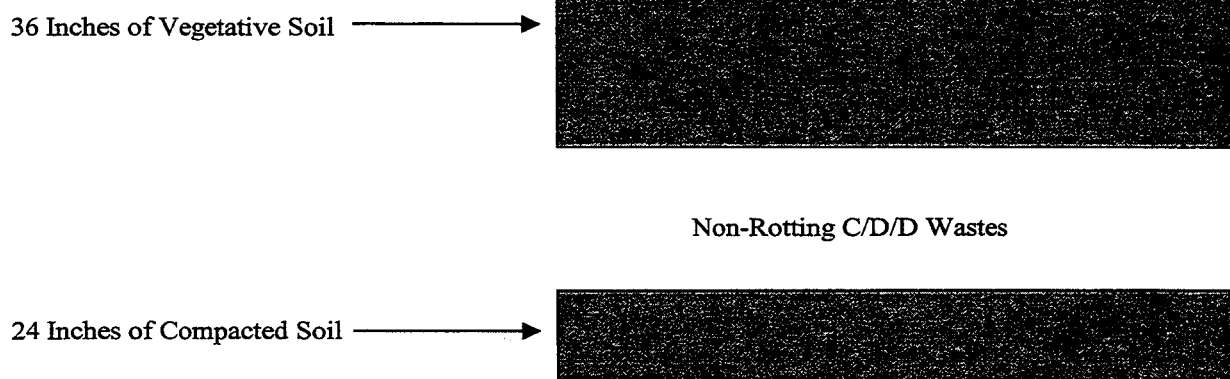




**Figure 4-1 Outlines the Minimum Liner and Cap design Described**



**Figure 4-1b**  
**Construction-Demolition Debris Landfill**  
**Putrescible Wastes Design Cross Section**  
**On Slopes**



**Figure 4-1c**  
**Construction/Demolition/Debris Landfill**  
**Non-Putrescible Wastes Design Cross Section**

### **Closure and Closure Care Requirements**

The technical application requires the applicant to develop a closure plan, which describes:

- The procedures and schedule for final closure,
- The phased closure and sequence, and
- The final cover designed to meet the following (starting with the first layer above the interim cover):
  - ✓ Waste cells graded to a slope of more than 5 and less than 25 percent,
  - ✓ 12 inches of a minimum  $1 \times 10^{-7}$  cm/sec permeability clay or its equivalent,
  - ✓ on slopes of less than 15 percent, six inch drainage layer of  $1 \times 10^{-3}$  cm/sec permeability sand with a system of drainage tiles to relieve water collected,
  - ✓ Filter fabric to protect the drainage layer,
  - ✓ Three feet of vegetative cover,
  - ✓ Diversion berms for locations where the runoff exceeds the holding capacity of the final cover, and
  - ✓ When the wastes in the landfill have been restricted to non-putrescible wastes or wastes that don't leach, the final cover layer may be reduced to a minimum of 3 feet of vegetative soil.

Closure regulations require the owner or operator to:

- Implement the closure plan and schedule. The owner or operator may submit a modification 90 days prior to the last date for accepting waste,
- Place final cover within 365 days over areas of the landfill which are completely filled (reached the final grade or maximum planned elevation),
- Not remove earth moving equipment until the Division inspects the site and determines compliance with approved plans and specification,
- Submit the records that the owner shall submit to verify quality control of the cap,
- Alter the deed to caution against future site disturbance of the area and proof of this change provided,

- Obtain the bond release two years following the Division's acceptance of the closure certification,
- Maintain the sign which lists the name, address and telephone number of the owner during closure care (401 KAR 48:060 section 2(5)),
- Perform corrective action work as specified by the Cabinet after the final cap inspection, and
- Follow the closure care plan for a minimum of 2 years which includes narrative on the activities to be undertaken after closure relative to:
  - ✓ Surface and groundwater monitoring,
  - ✓ Leachate collection and treatment,
  - ✓ Cap erosion and sediment control,
  - ✓ Cap re-vegetation and regarding,
  - ✓ Access controls, and
  - ✓ A schedule for monitoring and accomplishing these activities.

Registration of less than one acre sites for C/D/D wastes holds down the demand for full permits. The Cabinet added requirements in September of 1999 in 401 KAR 47:110 and the new 48:320. New regulations require that:

- The owner undergo a five day waiting period before the registration automatically takes effect to allow the Cabinet to check the background (compliance record) of the applicant,
- That the applicant publish a newspaper notice two weeks before submission of the registration,
- The Cabinet to hold a public meeting upon the request of any individual,
- The applicant to prepare a Groundwater Protection Plan (GPP) per 401 KAR 5:037,
- No two landfills be within 750 yards, and
- For landfills within a wellhead protection area (WPHA), as defined in 401 KAR 5:002 section 1, shall construct and maintain a liner and leachate collection system:

✓ **The Liner**

- Is a low permeability soil component with a minimum of twelve contiguous inches of  $1 \times 10^{-7}$  cm/sec maximum permeable material (clay) or its equivalent, and
- Covers the bottom and sidewalls of the facility with the bottom liner sloped toward the leachate collection system that complies with subsection 3 of this section.

✓ **The leachate collection system**

- Must have a minimum of a twelve inch layer of gravel or a layer of equivalent performance and a toe drain, and
- Discharges into a collection tank with a minimum capacity of 1,000 gallons.

**For more information on WHPA contact the Groundwater Branch at (502) 564-3140.**

### **Leachate Regulations**

A construction/demolition/debris landfill shall be designed to keep surface water flows and leachate separate. The design shall include: surface contours to minimize surface water running onto or through the operational or completed fill area (401 KAR 48:060 section 1):

- The leachate collection tank shall be a minimum of 1,000 gallons. Additional capacity shall be provided to store leachate for a minimum of fifteen days production at peak production rates during operation and closure (401 KAR 48:060 section 1(2)(5)(d)). **Note:** The key is to do the weekly cover and direct storm flow off the top of the cover towards the sediment pond away from the Leachate Collection System (LCS). **The consulting engineer and site manager must talk to make this happen correctly.**
- The method of leachate disposal shall be described. When it is discharged to the sediment structure, a treatment plant is proposed or other method of discharge is proposed, the KPDES permit shall reflect this provision. When an off site wastewater treatment plant is used, the applicant shall provide written documentation showing the acceptance of the waste. The criteria for disposal at the wastewater treatment plant shall be stated. The LCS shall have a method to measure the quantity of leachate managed at the site (401 KAR 48:060 section 1(2)(5)(e)). **Note:** One site has modified its KPDES permit to discharge C/D/D leachate and storm water to a stream.

## **Greater Than One Acre C/D/D Landfill Operational Requirements**

### **Operations**

The operating requirements for construction demolition debris landfills are located in 401 KAR 48:060, Section 2. Many of the operational requirements for C/D/D landfills are similar to those of contained landfills.

The most important operational aspect is to operate in accordance with the approved plans and the permit. Any permit conditions must also be followed.

Construction/demolition/debris landfills are not required to have scales. However, the facility must propose, in the permit application, a method of collecting this data, as monthly waste volumes are required as part of the quarterly reports. All landfills are required to complete an annual survey between January 1 and May 1 of each year. This survey is to determine, through cross sections, the current waste placement and the remaining capacity in cubic yards.

As with contained landfills, C/D/D landfills must comply with the following operational requirements:

- a sign must be placed at the junction of the landfill access road and public road for the active life of the facility
- a sign must be posted at the entrance to the landfill showing the names of the owner and operator, an emergency telephone number, operating hours and permit number. Signs must be constructed of durable, weather resistant material. Letters and numbers should be a minimum of 3 inches tall
- unauthorized public access must be controlled
- all-weather roads must be constructed
- the operator must observe all loads during dumping and spreading
- Scavenging is prohibited. Salvaging and recycling will not be allowed without prior Cabinet approval
- no free liquids or hazardous wastes may be disposed of at the landfill
- maintain ditches and sediment basins
- prevent run-on and runoff of surface water and prevent standing water
- no violations of Environmental Performance Standards (401 KAR 47:030)

## Compaction and Cover Requirements

C/D/D waste must be spread and compacted in thin layers sufficient to minimize void spaces during placement of lifts. No lift shall be greater than 8 feet or the depth approved in the application.

Operating equipment must be on site during operating hours and capable of spreading and compacting the volume of waste received at the site. Backup equipment must be available within one week of primary equipment breakdown.

A 12 inch soil cover must be applied to all areas of exposed waste at least once a week.

Temporarily re-vegetate or otherwise protect against erosion all areas not set to receive additional refuse or final cover within 90 days.

Within 365 days of the last placement of waste in an area, final cover should be applied. Final cover consists of the following:

- cell graded to a final slope of more than 5 and less than 25 percent,
- 12 inch cover layer overlain by 12 inches of  $1 \times 10^{-7}$  centimeters per second maximum permeability cap or its equivalent, (or 6 inches of  $1 \times 10^{-7}$  with plastic liner)
- 6 inch drainage layer ( $1 \times 10^{-2}$  cm/sec permeability, i.e., sand) if the slope is less than 15 percent) with field tiles, and
- 3 feet of vegetative soil.





## **CHAPTER 12**

### **RESIDUAL LANDFILL**

#### Chapter 12 Behavioral Objectives

1. List the types of waste that can be accepted at a residual landfill.
2. Explain the design requirements for a residual landfill.
3. Identify the closure and closure care requirements for residual landfills.
4. Understand the regulations for leachate in residual landfills.
5. List operational requirements for a residual landfill.
6. Understand the cover requirements for residual landfills.



## **CHAPTER 12**

### **RESIDUAL LANDFILL**

This section discusses the acceptable waste, design requirements, leachate regulations, and operational requirements for Residual Landfills.

#### **Types of Waste that can be Taken**

There are no detailed acceptable waste streams for residual landfills listed in the regulations. A residual landfill can only dispose of the waste streams listed on their permit. A TCLP analysis of all waste streams is required before disposal. In general, the following waste streams are not acceptable at residual landfills:

- hazardous waste
- municipal solid waste
- free liquids

#### **Design Requirements**

Residual landfills are designed and operated for the disposal of a specific type waste; thus, each design will vary. The regulations specify that the engineering design must be capable of meeting the Environmental Performance Standards, siting standards and consider the following:

- Volume to be disposed,
- Climate of area,
- Permeability of the liner material,
- Type of soil(s) underneath the facility,
- Hydrogeologic characteristics of the facility; including quality, quantity, current use and direction of groundwater flow,
- Proximity of the site to surface water and groundwater,
- Potential for gas emissions and odors,

- Design of the leachate, runoff and gas migration control systems relative to the specific waste to be disposed, climate and volume of leachate to be collected, and
- Characteristics of the waste – including how the liner and cover material will prevent hazardous chemicals from contaminating groundwater and surface water. A good rule of thumb is to use clay for waste containing only metals and a composite liner (clay and synthetic) for wastes containing organics. Otherwise, the engineer should model the effects of any hazardous substance migration through the liner and into the groundwater. Use the EPA help, ODAST, MODFLOW or similar to predict groundwater impacts of the given design.

To determine groundwater monitoring parameters, the applicant should:

- Do a waste analysis for those substances on the list in:
  - ✓ 40 CFR 264 Appendix IX (also 401 KAR 34:360),
  - ✓ 401 KAR 48:300 section 10 (the “big” list), or
  - ✓ the list of priority pollutants, or similar list.
- List any chemicals at concentrations above the detection limit for use in characterization groundwater monitoring,
- Chose several of the higher concentration organics and metals as “markers” for quarterly detection groundwater monitoring, in addition to the indicator and metals parameters specified in 401 KAR 48:300 section 11(2) for Residual and Construction/Demolition/Debris landfills, and
- Use the “markers” for modeling the liner and cap performance with regard to protecting groundwater.

### **Closure and Closure Care Requirements**

As part of the technical application, the applicant is required to develop closure plans for the site to ensure compliance with the Environmental Performance Standards. A residual landfill closure plan must address:

- Type and amount of waste in the facility,
- Mobility and expected rates of migration of the waste and leachate,

- Site:
  - ✓ Location,
  - ✓ Topography,
  - ✓ Surrounding land use, and
  - ✓ Final site use.
- Climate,
- Characteristics of the cover material, such as:
  - ✓ Composition,
  - ✓ Erodibility (ability to wash out),
  - ✓ Slope stability,
  - ✓ Surface contours (hilliness),
  - ✓ Thickness,
  - ✓ Porosity (the amount of holes or holiness),
  - ✓ Permeability (ability to slow water flow),
  - ✓ Slope,
  - ✓ Length of run of slope, and
  - ✓ Type of vegetation to be used.
- Geologic profiles,
- Soil profiles,
- Surface water flow, and
- Subsurface hydrology.

Once the facility owner quits accepting wastes, he begins to cap the landfill. When the construction is completed, the owner notifies the Division whom must inspect the site. A DWM representative inspects the site and reviews the records to determine the site's compliance with all regulatory requirements. A ninety percent permanent vegetation cover must be in place before the request for a final construction inspection is made.

After the Division accepts the owner's closure report, the facility must be maintained and monitored for a minimum of two years. This period is referred to as the closure care period. Once the two year closure care period expires, a DWM representative must inspect the site and review the records to determine the site's compliance with all regulatory requirements and that a ninety percent permanent vegetation cover exists. If the site is in compliance, the Division may release the closure and closure care bonds per 401 KAR 48:060 section 3(6) and KRS 224.40-650(3).

The owner or operator must implement this plan, plus any other corrective work specified by the Division, according to the closure care schedule. The deed for the property has to be altered to notify future purchasers of the following:

- Location of the waste disposal area,
- Time of operation of the facility,
- Nature of the waste, and
- Caution against future disturbance.

Once this work has been accomplished, the Division may accept the closure care certification prepared by the owner or his representative.

### **Leachate Regulations**

The design of the facility leachate control system, runoff control system and gas migration control, if required, as it relates to the physical and chemical characteristics of the waste, the climatic conditions of the specific location, the volume of leachate and contaminated runoff collected at the facility (401 KAR 48:170 section 1(7)).

### **Residual Landfill Operational Requirements**

#### **Operations**

The operational requirements for residual landfills can be found in 401 KAR 48:170, Section 2. The regulatory requirements are not as detailed as those for contained landfills and C/D/D landfills.

Residual landfills are not required to have scales. However, the facility must propose in the permit application a method of collecting this data as monthly waste volumes are required as part of the quarterly reports. All landfills are required to complete an annual survey between January 1 and May 1 of each year. This survey is to determine, through cross sections, the current waste placement and the remaining capacity in cubic yards.

Residual landfills must comply with the following operational requirements:

- **a sign** must be placed at the landfill **entrance** containing the landfill name, names of the owner and operator, operating hours, permit number, contact person, and emergency telephone number, and
- operate in accordance with their approved plans and comply with any permit conditions.

### **Cover Requirements**

There are no specific cover requirements or timelines for residual landfills such as there are for contained landfills and C/D/D landfills, therefore, requirements vary from landfill to landfill. Cover requirements for each landfill are listed in their approved landfill applications or on their permit as permit conditions. In order to be in compliance, approved plans must be followed.





## **CHAPTER 13**

### **SPECIAL WASTE LANDFILL**

#### Chapter 13 Behavioral Objectives

1. List the types of waste that are acceptable at a special waste landfill.
2. Explain the siting requirements for a special waste landfill.
3. Understand the regulations and requirements for the design of a special waste landfill.
4. Describe the closure and closure care requirements for special waste landfills.
5. Comprehend the operational requirements for special waste landfills.



## CHAPTER 13

### SPECIAL WASTE LANDFILL

This section discusses the acceptable waste stream, siting requirement, design and operational requirements, and leachate regulations for a Special Waste Landfill.

#### **Types of Waste that can be Taken**

An owner or operator may dispose only special waste in a special waste landfill. These wastes include utility coal combustion ash, air or water treatment sludges, and certain oil field wastes. As with residual landfills, there are no detailed acceptable waste streams for special waste landfills listed in the regulations. As long as the waste stream is listed as acceptable on the permit, it can be disposed of in a special waste landfill.

In general, the following waste streams are **not acceptable** at special waste landfills:

- hazardous waste
- municipal solid waste
- industrial solid wastes

#### **Siting Requirements**

Siting requirements, outlined below, apply to all new special waste landfills (401 KAR 45:130).

##### **Flood Plains**

Sites cannot restrict the flow of the 100 year flood or reduce the temporary water storage capacity of the flood plain. Operational methods at the site must prevent the washout of waste.

##### **Buffer Zones:**

The distance between the fill area and the following must be:

- |  |          |
|--|----------|
| • Property line  | 100 feet |
| • Intermittent or perennial stream<br>(Unless a water quality certification is issued) | 250 feet |
| • Sinkhole or other similar feature of karst terrain                                   | 250 feet |

- Wastes cannot be placed in the zone of collapse of deep mine workings or within the critical angle of draw of such workings.

### **Aquifers:**

No facility shall be permitted unless:

- The uppermost aquifer can be monitored to detect the constituents identified in 401 KAR 45:160, and
- Corrective action can be performed on the aquifer as specified in 401 KAR 45:160

### **Design Requirements**

Special waste landfills are designed and operated for the disposal of a specific type waste; thus, each design will vary. The regulations at 401 KAR 45:110 specify that the engineering design must be capable of meeting the EPS of 401 KAR 30:010 and the siting standards of 401 KAR 45:310 considering the following:

- Volume to be disposed,
- Climate of the area,
- Permeability of the liner material,
- Types of soil(s) underneath the facility,
- Hydrogeologic characteristics of the facility, including quality, quantity, current use and direction of groundwater flow,
- Proximity of the site to surface water and groundwater,
- Potential for gas emissions and odors,
- Design of the leachate, runoff and gas migration control systems relative to the specific waste to be disposed, climate and volume of leachate to be collected, and
- Characteristics of the waste, including how it will react when it comes in contact with the liner, cover materials and water. A good rule of thumb is to use clay for waste containing only metals and a composite liner (clay and synthetic) for wastes containing organics.

For coal combustion ash groundwater monitoring parameters, the applicant uses those specified in 401 KAR 45:160, Section 8(2).

To determine groundwater monitoring parameters for wastes other than coal combustion ash, the applicant should:

- Do a waste analysis for those substances on the list in:
  - ✓ 40 CFR 264 Appendix IX (also 401 KAR 34:360),
  - ✓ 401 KAR 48:300 section 10 (the “big” list), or
  - ✓ the list of priority pollutants or similar list.
- List any chemicals at concentrations above the detection limit for use in characterization groundwater monitoring, and
- Chose several of the higher concentration organics and metals as “markers” for quarterly detection groundwater monitoring.

### **Closure and Closure Care Requirements**

As part of the technical application, the applicant is required to develop closure plans for the site to ensure compliance with the EPS. A special waste landfill closure plan must address:

- The type and amount of waste in the facility,
- Mobility and expected rates of migration of the waste and leachate,
- Site:
  - ✓ Location,
  - ✓ Topography,
  - ✓ Surrounding land use, and
  - ✓ Final site use.
- Climate,
- Characteristics of the cover material, such as:
  - ✓ Composition,
  - ✓ Erodibility,

- ✓ Slope stability,
  - ✓ Surface contours,
  - ✓ Thickness,
  - ✓ Porosity,
  - ✓ Permeability,
  - ✓ Slope,
  - ✓ Length of run of slope, and
  - ✓ Type of vegetation to be used.
- Geologic profiles,
  - Soil profiles,
  - Surface water flow, and
  - Subsurface hydrology.

This plan plus any other corrective work specified by the Division must be implemented according to the closure care schedule. The deed for the property has to be altered to notify future purchasers of the:

- Location of the waste disposal area,
- Time of operation of the facility,
- The nature of the waste, and
- Caution against future disturbance.

Once this work has been accomplished, the Division may accept the closure care certification prepared by the owner or his representative.

After the Division accepts the owner's closure certification, the facility must be maintained and monitored for a minimum of five years. This period is referred to as the post closure periods. Once two years has past, the Cabinet may release the bond equal to:

- The closure cost estimate, and
- Two years of post closure maintenance.

This means that the bond should still contain enough for the final three years of maintenance (401 KAR 45:110, Section 5(6)).

Once the five year closure care period expires, the site must be inspected and records reviewed to determine the site's compliance with all regulatory requirements and that a ninety percent permanent vegetation cover exists. If the site is in compliance, the Division must release the closure bond within 180 days of its determination.

### **Leachate Regulations**

The design of the facility leachate control system, runoff control system and gas migration control, if required, as it related to the physical and chemical characteristics of the waste, the climatic conditions of the specific location, the volume of leachate and contaminated runoff collected at the facility (401 KAR 45:110 section 1(7)). **Note:** This is a best professional judgment call by the design team. For example: most coal combustion ash usually does not have leachate collection, since it sets up and sheds water. However, one paper sludge landfill does have leachate collection, since it has a plastic liner on clay.

### **Special Waste Landfill Operational Requirements**

#### **Operations**

The operational requirements for special waste landfills can be found in 401 KAR 45:110, Section 3. Similar to residual landfills, special waste landfills do not have requirements as detailed as contained and C/D/D landfills.

Special waste landfills must comply with the following operational requirements:

- a sign must be placed at the landfill entrance containing the landfill name, names of the owner and operator, operating hours, permit number, contact person, and emergency telephone number,
- comply with the Environmental Performance Standards in 401 KAR 30:031, and
- operate in accordance with their approved plans and comply with any permit conditions.

#### **Cover Requirements**

There are no specific cover requirements or timelines for special waste landfills such as there are for contained landfills and C/D/D landfills, therefore, requirements vary from landfill to landfill. Cover requirements for each landfill are listed in their approved landfill applications or on their permit as permit conditions. In order to be in compliance, approved plans must be followed.





## APPENDIX



## **A Guide for Monitoring Well Construction and Abandonment**

The Solid Waste Branch, Division of Waste Management, requires the following decontamination and construction activities at all solid waste facility monitoring well sites:

1. No monitoring well at a solid waste site may be constructed, modified, or abandoned without prior Division approval. Groundwater Monitoring Plan changes must be approved in advance by the Division.
2. A Kentucky certified monitoring well driller must perform all monitoring well construction, modification, or abandonment (see 401 KAR 6:310, Section 13).
3. The Kentucky certified monitoring well driller must provide the Cabinet with a record of the monitoring well construction. The record must be submitted on the form entitled “Kentucky Monitoring Well Record” (DEP 8043) to the Kentucky Division of Water. A copy of this record must also be provided to the Division of Waste Management.
4. The Division must be notified at least five (5) working days prior to any monitoring well construction, modification, or abandonment so that a Division representative may be present. A fifteen-day pre-notice is desired.
5. Decontamination must be performed at the landfill site and between boreholes. This requirement applies to monitoring well construction, modification, and abandonment. A decontamination point may be established or the decontamination may occur at each well site, downgradient of the borehole location. Decontamination of equipment is required for each well. If possible, upgradient wells should be drilled first.
6. Decontamination must be performed on all downhole equipment. This should also include all tools that come in contact with downhole equipment as well as the drilling platform, vertical drill pipe assembly (lazy susan), etc. Anything that could affect the borehole should be decontaminated.
7. The decontamination medium should be, at a minimum, potable water, used under pressure and heated to steam. Well water or formation water must not be used. Soap, if used, must be non-phosphatic (e.g., Alcinox or Liquinox). The drill rig water tank, the truck mounted water tank, and all other water tanks must have been used only for potable water.
8. Well casing, if not kept in individual factory-sealed plastic wrappers, must also be decontaminated prior to installation in the borehole.
9. Disposable plastic gloves must be used when handling all downhole equipment and well casing. Disposable cotton gloves may be used to handle augers and similar equipment that would tear plastic gloves.
10. The borehole site must be free of debris, including grass. Drill rig oil leaks must be contained, using a minimum 6 mil. thick plastic sheeting placed beneath the vehicle and drill rig. Alternate methods may be approved by the on-site Division geologist.

11. Air rotary drill rigs used to drill monitoring wells must prevent downhole contamination from the air compressor. A filtration system must be used that must remove 99.999% of 0.3 micron particles, both solid and aerosol, from the air stream when using an approved testing procedure. The air-filtration system must have a manufacturer's certification.
12. No lubricant may be used on drill pipe threads, unless approved in advance by the Division. An MSDS sheet must accompany such a request.
13. If coring has not been conducted prior to well construction within 10 feet of the well location, then geologic samples must be collected (at a minimum) every five feet. A professional geologist (or other person registered under KRS 322A in the Commonwealth of Kentucky) must describe all geologic cores, cuttings, or samples.
14. The well casing must consist of PVC or stainless steel. Other materials are acceptable if approved in advance by the Division. PVC monitoring well pipe must be certified for use in monitoring wells (e.g., NSF wc or NSF pw). The well casing diameter must be a minimum of 4.0-inches, unless otherwise approved in advance by the Division.
15. The borehole must be a minimum of 4.0 inches in diameter greater than the outside diameter of the casing. For instance, a 4.0-inch I.D., Schedule 40 PVC casing (which has an outer diameter of 4.5 inches) requires a 8.5-inch borehole. If the casing is set inside hollow-stem augers, the inside diameter of the hollow-stem auger should be at least 4.0 inches in diameter greater than the outside diameter of the monitoring well casing in order to prevent bridging of filter pack sand and bentonite pellets.
16. Centralizers are recommended in wells deeper than 50 feet.
17. The well casing must be threaded and gasket sealed with Teflon O-rings.
18. The well casing must extend a minimum of one (1.0) foot above ground level, unless otherwise approved by the Division.
19. A water-washed sand filter pack, with the sand sized larger than the screen openings, must be placed in the annulus in such a manner as to prevent bridging. (In general, the filter pack may be emplaced by the free-fall method if poured in slowly and carefully, and if the level of filter sand is constantly monitored with a weighted tape.) The filter pack must rise at least two feet above the screen. At least six inches of filter pack should be placed below the bottom of the casing for the screen cushion. All measurements should be made with a decontaminated measuring tape.
20. In unconsolidated aquifers, the sand filter pack size and screen opening width must be determined based upon sieve analysis of the aquifer materials.
21. Filter pack materials are not acceptable unless proper documentation can be furnished as to the composition, grain size distribution, cleaning procedures, and chemical analysis of the material.

22. A bentonite seal consisting of pure bentonite pellets (at least 3/8 inches in diameter) must be placed in the annulus in such a manner as to prevent bridging. Other forms of bentonite are not acceptable, unless approved in advance by the Division. In general, the bentonite pellets may be emplaced by the free-fall method if poured in slowly and carefully, and if the level of bentonite pellets is constantly monitored with a weighted tape. The seal must rise at least two feet above the top of the sand filter pack. All measurements should be made with a decontaminated measuring tape.
23. Potable water must be used, if necessary, as the hydration medium. Hydration time of the bentonite pellets must be a minimum of eight hours or the manufacturer's recommendation, whichever is greater.
24. Well integrity and annulus integrity must be protected during hydration of the bentonite pellets. The well should be covered during hydration to prevent material from falling down the borehole, and the borehole sidewalls should be protected from collapse with temporary casing if necessary.
25. The grout to be used in the annulus, above the bentonite seal, must consist of one of the following: a) high solids (at least 30% solids) pure bentonite grout; b) neat cement; or c) cement/bentonite grout of a 90/10 ratio. Pure, high solids bentonite grout is preferred.
26. The density of bentonite grouts must be measured while mixing. No pumping of bentonite grout into the annulus may occur until the minimum density of 9.4 pounds per gallon has been obtained. Only potable water may be used in mixing grouts.
27. Cement grouts should be mixed using 6.5 to 7.0 gallons of potable water per 94-pound bag of Portland cement (Type 1).
28. Drilling muds may not be used for grouting.
29. The grout must be placed in the annulus by the tremie method (pressure grouting) from the top of the bentonite seal to within three feet of the ground surface or below the frost line, whichever is greater.
30. The grout must be allowed to set for a minimum of 24 hours before the concrete pad, surface casing, and protective barrier are installed. Well integrity and annulus integrity must be protected during the curing of grout.
31. The top three feet of the annulus must be filled with a Portland cement concrete (50% sand / 50% cement), bonded to the well casing, with the protective cover installed in the concrete.
32. Each monitoring well must have a concrete pad at least four inches thick, extending two feet around the well and sloped away from the well. This requirement is met by a four-foot square pad, four inches thick, or a four-foot diameter round pad, four inches thick. A frost sleeve should be installed between the pad and the protective surface casing. A minimum of one inch of the completed pad must extend below grade to prevent washing and undermining by soil erosion.

33. The monitoring well must be enclosed in a protective surface casing that is sufficient to reliably protect the well from damage. The protective surface casing: a) should be installed in firm rock unless otherwise provided for by the Division; b) should extend a minimum of three (3.0) feet below the ground surface; c) should be grouted and placed with a cement collar below the frost line to hold it firmly in place; d) should be numbered (with both the facility well number and the AKGWA number) and be painted a highly visible color; e) should protrude at least one inch above the top of the monitoring well casing; f) should have a locked cap; and g) should be made of steel or a material of equivalent strength.
34. The monitoring well must be protected by a barrier (i.e., steel posts) sufficient to shield the protective surface casing from damage by vehicles and equipment. A minimum of four posts is required. The posts: a) should be a minimum of three (3.0) inches in diameter and five (5.0) feet in length; b) should be set a minimum of two (2.0) feet below grade in concrete; c) should extend at least three (3.0) feet above grade; d) should be filled with concrete to increase strength; and e) should be painted a highly visible color.
35. A new monitoring well should not be developed until 24 hours after the completion of the surface pad, and the outer protective surface casing is installed.
36. During development, the well should be pumped until the water runs clear and three successive readings (taken at five-minute intervals) of pH, temperature, turbidity, and specific conductivity have stabilized.
37. All monitoring wells must be maintained to original as-built specifications. Any monitoring well which has been damaged, or is otherwise unsuitable for use as a monitoring well, must be abandoned within 30 days of the last sampling date, or when notified by the Division.
38. No monitoring well may be repaired without prior Division approval.
39. In abandoning monitoring wells, the monitoring well borehole must be over drilled, and all downhole materials (well casing, filter pack, bentonite seal, grout, cement, concrete, etc.) must be removed prior to filling the resulting borehole with pure high-solids (at least 30% solids) bentonite grout or cement-bentonite (90/10 ratio) grout by tremie pipe (pressure grouting) from the bottom to the top of the hole. The diameter of the drill bit or augers used to abandon monitoring wells must be at least equal to the original borehole diameter. In rare instances where the monitoring well casing cannot be removed, an alternate method of abandonment may be employed, but only if approved in advance by the Division.
40. No formation, well, or surface water may be used in mixing grout for the construction or abandonment of monitoring wells. Only potable water from a municipal water source may be used in mixing grout or hydrating bentonite pellets.
41. Special precautions must be used at potentially contaminated sites. Contaminated groundwater or drilling fluids must be contained in drums or tanks, tested, and properly disposed of. Contaminated drill cuttings must be placed on plastic sheeting and covered prior to being tested, and properly disposed of.

42. The Kentucky certified monitoring well driller must provide the Cabinet with a record of the monitoring well abandonment. The record must be submitted on the form entitled "Kentucky Monitoring Well Record" (DEP 8043) to the Kentucky Division of Water. A copy of this record should be provided to the Division of Waste Management.

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## CONTACTS BY TOPIC

The Division of Compliance Assistance is now responsible for the implementation of the landfarm certification. The Division of Waste Management is still responsible for the permits, annual review and reporting requirements. The information below offers the reader a contact person for various areas of assistance.

### **Division of Compliance Assistance**

*Phone Number: 502-564-0323 or 800-926-8111*

*Fax Number: 502-564-9720*

- Certification (training, testing & fees)
- Compliance Assistance
- Open records requests related to certification
- Regulations related to certification

Lisa Butler  
Kenya Stump  
Julia Kays  
Julia Kays

### **Division of Waste Management**

*Phone Number: 502-564-6716*

*Fax Number: 502-564-3492*

- Technical assistance on permits
- Landfarm & Compost
- Annual review assistance

Ron Gruzesky  
Bob Bickner  
Frank Whitney  
Robin Green

- Solid Waste Landfills

Ron Gruzesky  
Lindsey Briggs  
Ken Melton

- Forms and fees not related to certification;  
Bonding and reporting requirements

LeMoyne Pilcher  
Anita Young  
Stephen Kempf  
John Arnett  
Deborah DeLong

- Open records requests related to facilities
- Regulations related to facility requirements
- Complaints
- Facility inspections
- Enforcement

Tina Fisher  
Cassandra Jobe  
Duke York  
Jon Maybriar  
Jeff Cummins (502-564-2150)

DWM Field Offices

<b>Field Offices</b>	<b>Phone Number</b>	<b>Office Supervisor</b>
Bowling Green	270-746-7475	Todd Johnston
Columbia	270-384-4735	John Rogers
Florence	859-525-4923	Michael Fant
Frankfort	502-564-3358	Richard Thomas
Hazard	606-435-6022	Greg Eldridge
London	606-330-2080	Bill Belcher
Louisville	502-429-7120	Keith Sims
Madisonville	270-824-7532	Larry Tichenor
Morehead	606-784-6634	Karen Hall
Paducah	270-898-8468	Marjorie Williams

## GLOSSARY

**ACRE:** Unit for measuring land, equal to 43,560 square feet, 4,840 square yards; or 160 square rods.

**AERATION:** The process of exposing something to air or charging a liquid with gas.

**AEROBIC:** Bacteria, which require the presence of free (dissolved or molecular) oxygen for their metabolic processes. Oxygen in chemical combination will not support aerobic organisms.

**AGGREGATE:** Crushed rock or gravel screened to sizes for use in road surfaces, concrete, or bituminous mixes.

**AGRICULTURAL WASTE:** Waste materials produced from the raising of plants and animals for food. These materials include such things as animal manure, plant stalks, hulls and leaves.

**AIR POLLUTION:** The presence of contaminants in the air to such a degree that the normal self-cleansing or dispersive ability of the atmosphere cannot cope with them.

**ALKALINITY:** A quantitative measure of the capacity of liquids or suspensions to neutralize strong acids or to resist the establishment of acidic conditions. Alkalinity results from the presence of bicarbonates, carbonates, hydroxides, volatile acids, salts, and occasionally of borates, silicates and phosphates. Numerically, it is expressed in terms of the concentration of calcium carbonates that would have an equivalent capacity to neutralize strong acids.

**ALGAE:** Plants found in sunlit situations on land, as well as in fresh and salt water over a wide range of latitude, grow as individual cells, small clumps, or as large masses.

**ANAEROBIC:** Bacteria that do not require the presence of free or dissolved oxygen for metabolism. Strict anaerobes are hindered or completely blocked by the presence of dissolved oxygen and in some cases by the presence of highly oxidized substances such as sodium nitrates and perhaps sulfates.

**ANGLE OF REPOSE:** The maximum angle at which the inclined surface of a pile of loosely divided material can make with the horizon.

**AQUIFER:** A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

**ASHES:** The residue from the burning of wood, coal, coke, and other combustible material.

**BACKEND LOADER (REFUSE TRUCK):** A compactor truck, which has its power-driven, loading equipment at the rear, behind the body.

**BACKFILL:** The material used in refilling a ditch or other excavation or the process of such refilling.

**BACKHOE:** A mechanical hoe or pull shovel.

**BACTERIA:** Single-celled organisms, microscopic in size, which possess rigid cell walls and when moving have flagella. The cell nucleus is not surrounded by a membrane. There are three major groups: true bacteria, actinomycetes, and budding bacteria. Some are capable of causing human, animal, or plant diseases. Some are important in sewage or refuse stabilization.

**BEARING CAPACITY:** Maximum ability of a material, to support an imposed load, before failure.

**BEDROCK:** The solid rock underlying soils and the mantle rock or exposed rock at the surface without a cover.

**BENCH MARK:** A point of known or assumed elevation used as a reference in determining and recording other elevations.

**BERM:** An artificial ridge of earth.

**BIODEGRADABLE:** Waste material that is capable of being broken down by bacteria into basic elements. Most organic waste, such as food remains and paper, is biodegradable.

**BIO-CHEMICAL OXYGEN DEMAND (BOD):** A measure of the amount of oxygen used by microorganisms to break down organic waste materials in water.

**BITUMINOUS:** Containing asphalt or tar.

**BLADE:** Steel plate, concave in vertical plane, affixed to a tractor used for excavation and spreading.

**BLADE (SANITARY LANDFILL):** A U-blade with extension fabricated on top to increase volume of solid waste that may be pushed and spread.

**BLADE (U):** A dozer blade with-extension on both sides, protruding forward at an obtuse angle to the blade, enabling handling of a larger volume of solid waste.

**BLUE TOPS:** Grade stakes whose tops indicate finished grade level.

**BORING:** Rotary drilling.

**BORROW PIT:** An excavation from which material is taken to a nearby job.

**BOULDER:** A rock that is too heavy to be lifted readily by hand.

**BUCKET:** An open container affixed to movable arms of a loader to move and spread solid waste and soil and also to excavate soil.

**BULKY WASTE:** Large items of refuse, such as appliances, furniture, large auto parts, trees and branches, palm fronds, stumps, foliage, etc.

**BULLDOZER:** A tractor equipped with a front pusher blade.

**BURNER, REFUSE:** A device for either municipal or on-site volume reduction of refuse by burning and of simple construction, not to be confused with incinerator, which, properly designed and operated, can produce an acceptable emission and residue.

**CARBON DIOXIDE:** An odorless, tasteless, colorless, and nonpoisonous gas. One source is from sanitary landfills undergoing aerobic and/or anaerobic microbial decomposition, which is highly soluble in water, forming carbonic acid.

**CARBON MONOXIDE (CO):** A colorless gas characterized by an exceedingly faint metallic odor and taste. It is extremely poisonous, inducing asphyxiation. As much as 0.2% in air is poisonous and 0.43% will induce asphyxiation.

**CELL:** The volume of compacted solid waste enclosed in a portion of a landfill which is isolated, usually by means of an approved barrier.

**CELL DEPTH:** Vertical thickness of compacted solid waste enclosed in a portion of a landfill which is isolated, usually by means of an approved barrier.

**CELL THICKNESS:** Perpendicular distance between cover material placed over the last working faces of two successive cells in a sanitary landfill.

**CHIPPER:** A size reduction device relying primarily on the shearing, cutting, or chipping action produced by sharp-edged blades attached to a rotating shaft (mandrel) which shaves or chips off pieces of the charged object.

**COLLECTION:** The act of picking up waste materials at homes, businesses, or industrial sites, usually with an enclosed truck, and hauling it to a facility for further processing or action.

**COMBUSTIBLES:** Various materials in the waste stream which are burnable, in general, these are organic in nature; paper, plastics, wood and food wastes.

**COMMERCIAL SOLID WASTE:** Waste material which is generated by stores, offices, restaurants, warehouses, and other service and non manufacturing activities, excluding household and industrial solid waste.

**COMMUNICABLE DISEASE:** An illness due to an infectious agent or its toxic products which is transmitted directly or indirectly to a well person from an infected person or animal, or through the agency of an intermediate host, vector, or inanimate environment.

**COMPACTION:** Reduction in bulk of fill by rolling and tamping.

**COMPACTOR:** Any power driven mechanical equipment designed to compress and, thereby, reduce the volume of waste materials.

**COMPACTOR TRUCK:** A large truck with an enclosed body having special power driven equipment for loading, compressing and distributing waste materials within the body.

**COMPOST:** A type of solid waste which has undergone biological decomposition of organic matter, been disinfected using composting or similar technologies, been stabilized to a degree which is potentially beneficial to plant growth and which is approved for use or sale as a soil amendment, artificial topsoil, growing medium amendment, or other similar uses.

**CONSTRUCTION MATERIALS:** Non-hazardous, non-soluble material, including but not limited to steel, concrete, brick, asphalt roofing material, or lumber from a construction or demolition project. Mixture of construction and demolition debris with any amount of other types of waste may cause it to be classified as other than construction materials.

**COVER MATERIAL:** Soil or other suitable material that is spread and compacted on the top and side slopes of disposed waste in order to control disease vectors, gases, erosion, fires, and infiltration of precipitation or run-on; support vegetation; provide trafficability; or assure aesthetic appearance.

**CRUSHER:** A mechanical device used to break up waste material into smaller sized pieces by a pounding action (hammers or beaters).

**CULLET:** Scrap glass, usually broken up into small, uniform pieces.

**DECOMPOSITON:** The breakdown of organic waste materials by bacteria. Aerobic process refers to one using oxygen breathing bacteria, while anaerobic refers to a process using bacteria, which breathe an inorganic oxidant. Total decomposition leaves only carbon dioxide, water and inorganic solids. Decomposition occurs spontaneously in the open (dumps and landfills) or can be harnessed in waste treatment equipment to work under controlled conditions.

**DEMOLITION WASTE:** Waste materials produced from the destruction of buildings, roads, sidewalks, etc. The materials usually include large broken pieces of concrete, pipe, radiators, ductwork, electric wire, broken up plaster walls, lighting fixtures, bricks and glass.

**DENSITY:** The ratio of the weight of a substance to its volume.

**DEPTH OF FILL:** Total distance between undisturbed earth or bottom of solid waste in the sanitary landfill and top of final cover material.

**DESIGN RUNOFF RATE:** Maximum runoff rate (occurring expected) in a given period of time, during and immediately following rainfall.

**DEWATERING:** The removal of water by filtration, centrifugation, pressing, open air-drying of other methods. Dewatering makes sewage sludge suitable for disposal by burning or landfilling. The term is also applied when removing water from pulp.

**DIGESTER:** Specially designed equipment in which waste materials are softened or decomposed, usually for further processing.

**DIKE:** An embankment or ridge of either natural or plan-made materials used to prevent the movement of liquids, sludges, solids or other materials.

**DISPOSAL, ONSITE:** Includes all means of disposal of refuse on premises before collection. Examples are: garbage grinding, burning, or incineration, and burial.

**DISTILLATION:** A separation process used to remove water from waste materials in some treatment or recovery systems. The water is vaporized, removed from the unit and condensed back into a liquid.

**DISPOSAL:** The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment, be emitted into the air, or be discharged into any water, including groundwaters.

**DUMP:** An open land site where waste materials are burned, left to decompose, rust, or simply remain. In most localities, dumps are being phased out because of the problems they cause, such as water pollution, creating of unsanitary conditions and general unsightliness. Some dumps are left burning as waste is accumulated. This practice does not lend itself to control and, therefore, very little of the waste is actually consumed by fire. The burning also generates obnoxious smoke, fumes and ash particles.

**ECOLOGY:** A branch of science concerned with the interrelationship of all animals, plants, insects and other organisms and their environment.

**EFFLUENT:** Any solid, liquid, or gas which enters the environment as a by-product of man-oriented processes.

**EMISSIONS (GASEOUS):** Waste gases released into the atmosphere as the product of combustion.

**ENERGY RECOVERY:** One of the concepts of resource recovery where a part, or all, of the waste materials going into a recovery facility are burned to produce heat which can be used to produce steam for heating or for the generation of electricity.

**ENVIRONMENT:** The air, the water and the earth, sometimes called the biosphere.

**ENVIRONMENTAL PROTECTION AGENCY (EPA):** An agency of the Federal Government, formed in 1970, which has the responsibility for ensuring that governmental, residential, commercial and industrial waste disposal activities do not adversely impact the physical environment.

**EROSION, SOIL:** The wearing away of the land surface normally by wind or running water.

**EVAPOTRANSPIRATION:** The sum of water removed by vegetation and that lost by evaporation for a particular area during a specified time.

**FERROUS:** Metals which are predominantly composed of iron. In me waste stream, these usually include cans, automobiles, old refrigerators, stoves, etc.

**FILTER:** A device through which a liquid or gas is passed in order to remove small particles or dust.

**FLY ASH:** Small solid particles of ash and soot generated when burning coal, oil or waste materials. With proper equipment, fly ash is collected before getting into the atmosphere. Fly ash residue can be used for building materials (bricks) or in a sanitary landfill.

**FOSSIL FUELS:** Fuels, such as coal, oil and natural gas, which are the remains of ancient plant and animal life.

**FRONTEND LOADER (REFUSE TRUCK):** A compactor truck which has its power driven loading equipment at the front; ahead of the cab.

**GARBAGE:** Waste materials which are likely to decompose or putrefy and usually contain food wastes from a kitchen, restaurant, grocery store, slaughter house or food processing plant.

**GASES:** Normally formless fluids which occupy the space of enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature.

**GOVERNING BODY:** The body responsible for implementation of the area solid waste management plan and review of permit applications to construct or expand municipal solid waste disposal facilities. This review is to determine if the application is consistent with the plan.

**GRADER:** A gas or diesel pneumatic wheel machine equipped with a centrally located blade that can be angled to cast to either side, with independent hoist control on each side.

**GRAVITY SEPARATION (FLOTATION, HEAVY MEDIA):** The collection of substances immersed in a liquid by taking advantage of differences in specific gravities. In solid waste recovery, this process enables separation of the various non-ferrous metals from other heavy materials.

**GRINDER:** A mechanical device used to pulverize waste material into powder or small particles by a friction action (I.E., by rubbing between two hard surfaces).

**GRINDING (GARBAGE):** A method of uniformly breaking food waste or garbage into small pieces or particles. The grinding device may be in a home sink unit or a large central grinder which serves industry or the community. Home units are usually flushed with water into the sanitary sewer.

**GROUND WATER:** Water which is in a zone of saturation. It is differentiated from water held in the soil, from water in downward motion under the force of gravity in the unsaturated zone, and from water held in chemical or electrostatic bondage.

**GROUSER:** A ridge or cleat across a track shoe mat improves its grip on the ground.

**HAMMERMILL:** A mechanical device that is used to break up waste materials into smaller pieces or particles by using a system of heavy rotating hammers.

**HARDPAN:** Hardened; compacted or cemented soil horizon.



**HAUL DISTANCE:** (a) Distance which covered material must be transported to the working face. (b) Distance collection truck must travel from its last pick-up stop to the working face or a sanitary landfill or tipping floor of a solid waste volume reduction or disposal facility. (c) Distance transfer vehicle must travel from solid waste processing station to point of final disposal.

**HAUL, TIME:** Elapsed or cumulative time spent hauling collected refuse from the route or from transfer station to the disposal point

**HAZARDOUS WASTE:** As defined in 401 KAR 31:010, Section 3.

**HOUSEHOLD SOLID WASTE:** A type of solid waste including garbage and trash generated by single and multiple family residences, hotels, motels, bunkhouses, ranger stations, crew quarters, and recreational areas such as picnic areas, parks, and campgrounds.

**INCINERATOR:** An enclosed device using controlled flame combustion, the primary purpose of which is to thermally break down waste. Examples of incinerators are: rotary kiln, fluidized bed, and liquid injection incinerators.

**INDUSTRIAL SOLID WASTE:** Those solid waste materials generated by manufacturing or industrial processes that are not a hazardous waste or a special waste, including wastes resulting from manufacturing processes.

**JUNK:** Waste materials, such as brass, rags, paper or metals. The term usually implies that the materials can be recovered for reuse or converted to usable stock.

**LEACHATE:** A liquid containing decomposed waste, bacteria and other dangerous materials that drains out of landfills and must be collected and treated so as not to contaminate water supplies, rivers or streams.

**LITTER:** That highly visible portion of solid waste, generated by the consumer and carelessly discarded outside of the regular disposal system. Litter accounts for about only 2 percent of the total solid waste volume.

**LOAM:** A soft, easily worked soil containing sand, salt, and clay.

**MANUAL SEPARATION:** The separation of waste materials by hand. Sometimes called hand picking, manual separation is done in the home or office by keeping garbage separate from newspapers, or in a recovery plant by picking out large cardboard or metal objects.

**MATERIALS RECOVERY:** One of the concepts of resource recovery where the emphasis is on collecting, separating and processing waste materials to be sold for various purposes. Materials include paper, glass, metals, plastics, etc.

**METHANE:** An odorless, colorless, flammable gas which can be formed by the decomposition of organic waste matter. It is also produced by the carbonization of coal and used as fuel.

**MICROORGANISMS:** Generally, any living thing microscopic in size and including: bacteria, yeast's, simple fungi, some algae, slime molds and protozoa's. They are involved in stabilization of waste materials (composting) and in sewage treatment processes.

**MIXED PAPER:** Waste paper of various kinds and quality usually collected from stores, offices and schools.

**MUNICIPAL SOLID WASTE:** The combined residential and commercial waste materials-generated in a given municipal area. The collection and disposal of these wastes are usually the responsibility of local government.

**NEWSPRINT:** The kind or type of paper generally used for printing newspapers.

**NON-FERROUS:** Metals which contain no iron. In waste materials, this is usually aluminum, copper wire, brass, bronze, etc.

**OPEN BURNING:** The combustion of any material without: (a) Control of combustion air to maintain adequate temperature for efficient combustion; (b) Containment of the combustion reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion; and (c) Control of emission of the gaseous combustion products.

**ORGANIC MATTER:** Chemical compounds of carbon combined with other chemical elements and generally manufactured in the life processes of plants and animals. Most organic compounds are a source of food for bacteria and are usually combustible.

**PARTICULATES:** Small particles of liquid or solid material.

**PERCOLATION:** A qualitative term applying to the downward movement of water through soil.

**PERMEABILITY (QUALITATIVE):** The quality or state of a porous medium relating to the readiness with which it conducts or transmits fluids.

**POLLUTION:** The presence in a body of water (or soil or air) of substances of such character and in such quantities that the, natural quality of the body of water (or soil or air) is degraded so it impairs the water's usefulness or renders it offensive to the senses of sight, taste, or smell. Contamination may accompany pollution. In general, a public health hazard is created, but in some cases only economy or esthetics are involved as when waste salt brines contaminate surface waters and when foul odors pollute the air.

**PRECIPITATION:** The physical or chemical separation of a solid substance from solution. The separation is usually induced, such as in waste treatment process equipment

**PRIMARY MATERIALS:** Virgin or new materials used for manufacturing, basic products. Examples include wood pulp, iron ore and silica sand.

**PRIVATE UTILITY:** A firm providing service under a government license or monopoly franchise to collect, transport, process or dispose of waste materials.

**PUTRESCIBLE:** Susceptible to rapid decomposition by bacteria, fungi, or oxidation sufficient to cause nuisances such as odors, gases, or other offensive conditions.

**RECLAMATION:** The restoration to usefulness or productivity of materials found in the waste stream. The reclaimed materials may be used for purposes which are different from their original usage.

**RECYCLING:** Separating a given waste material (e.g., glass) from the waste stream and processing it so that it may be used again as the raw material for products which may, or may not be similar to the original.

**REFUSE:** A generally used term for solid waste materials.

**RESIDENTIAL WASTE:** Waste materials generated in houses and apartments. The materials include paper, cardboard, beverage and food cans, plastics, food wastes, glass containers and garden wastes.

**RESIDUE:** The solid materials remaining after completion of a chemical or physical process, such as burning, evaporation, distillation or filtration.

**RESOURCE RECOVERY:** The process by which material subject to the waste management regulations which still have useful physical or chemical properties are reused or recycled for the same or other purposes, including uses as an energy source.

**RUBBISH:** Waste materials, usually of a generally undefined nature.

**RUBBLE:** Waste materials made up mainly of fragments or pieces of rock or masonry. Sometimes containing lumber or other construction materials.

**RUNOFF:** Any rainwater, leachate or other liquid that drains overland from any part of a facility.

**SALVAGING:** The controlled removal, of waste materials for utilization in a manner approved by the department.

**SANITARY LANDFILL:** A solid waste disposal facility permitted for the disposal of solid waste which complies with the "Environmental Performance Standards" specified in 401 KAR 47:030.

**SCAVENGING:** The removal of waste materials from a waste management facility site in a manner deemed by the department to be dangerous to the health and safety of any person.

**SCRAP:** Waste material which is usually segregated and suitable for recovery or reclamation.

**SECONDARY MATERIALS:** Uniformly segregated and processed waste materials from a recycling plant which are sold to manufacturers for use in making basic products. For example, waste glass is turned into clean, uniform pieces of broken glass (cullet) which is sold to glass bottle manufacturers.

**SEEPAGE:** Movement of water through soil without formation of definite channels.

**SEPARATION:** To divide waste into groups of similar materials, such as paper products, glass, food wastes and metals. Also, used to describe the further sorting of materials into more specific categories, such as clear glass and dark glass. Separation may be done manually or with specialized equipment

**SHALE:** A rock formed of consolidated mud.

**SHREDDER:** A mechanical device used to break up waste materials into smaller pieces. The pieces are usually in the form of irregularly shaped strips.

**SLOPE:** Degree of deviation of a surface from the horizontal usually expressed in percent or degrees.

**SLUDGE:** Any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of the treated effluent from a wastewater treatment plant or any other such waste having similar characteristics and effects.

**SPOTTER:** In truck use, the man who directs the driver into loading or dumping position.

**STAKE, SLOPE:** A stake marking the line where a cut or fill meets the original grade.

**STOCKPILE:** Material dug and piled for future use.

**SUBSOIL:** That part of the soil beneath the topsoil, usually not having an appreciable organic matter content.

**SURFACE WATER:** A body of water whose top surface is exposed to the atmosphere including a flowing body as well as a pond or lake.

**SURVEYING:** To find and record elevations, locations, directions, by means of instruments.

**TOPSOIL:** The topmost layer of soil, usually refers to soil containing humus, which is capable of supporting a good plant growth.

**TOPOGRAPHIC MAP:** A map indicating surface elevation and slope.

**TRACK:** A crawler track.

**TRACK, CRAWLER:** One of a pair of roller chains used to support and propel a machine. It has an upper surface which provides a track to carry the wheels of the machine, and a lower surface providing continuous ground contact.

**TRACK, ROLLER:** In a crawler machine, the small wheels which are under the track frame and rest on the track.

**TRACTOR LOADER (TRACTOR SHOVEL OR SHOVEL DOZER):** A tractor equipped with a bucket, which can be used to dig and to elevate to dump at truck height.

**TRACTOR, PNEUMATIC WHEEL:** A gas or diesel powered machine equipped with four pneumatic tires, used to spread, excavate and compact soil and solid waste.

**TRACTOR, TRACK:** A gas or diesel powered machine equipped with continuous roller belt over cogged wheels for moving over rough or low bearing capacity terrain, used to spread, excavate and compact soil and solid waste.

**TRASH:** Waste materials which usually do not include garbage but may include other organic materials, such as plant trimmings.

**UNIVERSAL COLLECTION:** A municipal solid waste collection system which is established by ordinance and approved by the Cabinet and requires access for each household or solid waste generator in a county.

**URBAN WASTE:** A general term used to categorize the entire waste stream from an urban area. It is sometimes used in contrast to "Rural Waste."

**VIRGIN MATERIAL:** Any basic material from industrial processes which has not previously been used. For example, wood pulp trees, iron ore, silica sand, crude oil, bauxite.

**WATERSHED:** Total land area above a given point on a stream or waterway that contributes runoff to that point

**WATER TABLE:** The surface of underground, gravity-controlled water.

**WORKING FACE:** That portion of the compacted solid waste at a sanitary landfill, which will have more waste placed on it and/or is being compacted prior to, placement of cover material.

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<b>ACRONYMS USED IN THIS MANUAL</b>	
<b>ADC</b>	Alternative daily cover
<b>BOD</b>	Biochemical oxygen demand
<b>CFR</b>	Code of Federal Regulations
<b>C/D/D</b>	Construction/Demolition/Debris
<b>CERCLA</b>	Comprehensive Environmental Response, Compensation and Liability Act
<b>COD</b>	Chemical oxygen demand
<b>CPR</b>	Cardiopulmonary resuscitation
<b>DOT</b>	Department of Transportation
<b>EHS</b>	Extremely hazardous substance
<b>EPA</b>	Environmental Protection Agency
<b>EPCRA</b>	Emergency Planning and Community Right-to-Know Program
<b>ERP</b>	Emergency response plan
<b>ERT</b>	Emergency response team
<b>FD</b>	Fire Department
<b>FML</b>	Flexible membrane liner
<b>HDPE</b>	High density polyethylene
<b>HELP</b>	Hydrologic evaluation of landfill performance
<b>IDLH</b>	Immediately dangerous to life and health
<b>KAR</b>	Kentucky Administrative Regulations
<b>KPDES</b>	Kentucky Pollutant Discharge Elimination System
<b>KRS</b>	Kentucky Revised Statute
<b>LDPE</b>	Low density polyethylene
<b>LEL</b>	Lower explosive level
<b>LEPC</b>	Local emergency planning committee
<b>LF</b>	Landfill
<b>LULU</b>	Locally unacceptable land use
<b>MEK</b>	Methyl ethyl ketone
<b>MRF</b>	Materials recovery facility
<b>MSDS</b>	Material safety data sheet
<b>MSHA</b>	Mine Safety and Health Administration
<b>MSW</b>	Municipal solid waste
<b>NIOSH</b>	National Institute of Occupational and Safety Health
<b>NOI</b>	Notice of Intent
<b>NOV</b>	Notice of Violation
<b>NRC</b>	National Response Center
<b>OSHA</b>	Occupational Safety and Health Administration
<b>PCB</b>	Polychlorinated biphenyl
<b>PEL</b>	Permissible exposure level
<b>PETE</b>	Polyethylene terephthalate
<b>pH</b>	Negative logarithm of hydrogen ion concentration
<b>POTW</b>	Publicly owned treatment works

<b>PP</b>	Polypropylene
<b>PS</b>	Polystyrene
<b>PURPA</b>	Public Utility Regulation and Policy Act
<b>PVC</b>	Polyvinyl chloride
<b>QA/QC</b>	Quality assurance/quality control
<b>RCLA</b>	Resource Conservation and Local Assistance
<b>RCRA</b>	Resource Conservation and Recovery Act
<b>RDF</b>	Refuse derived fuel
<b>RQ</b>	Reportable quantity
<b>SARA</b>	Superfund Amendments and Reauthorization Act
<b>SERC</b>	State emergency response coordinator
<b>SIC</b>	Standard industrial code
<b>SVOC</b>	Semi-volatile organic compound
<b>TCLP</b>	Toxicity characteristic leaching procedure
<b>TDS</b>	Total dissolved solids
<b>TLV</b>	Threshold limit value
<b>TOC</b>	Total organic carbon
<b>TPQ</b>	Threshold planning quantity
<b>TQM</b>	Total quality management
<b>TSS</b>	Total suspended solids
<b>VOC</b>	Volatile organic compound



## Solid Waste Operator Certification Regulations

### 401 KAR 45:090. Special waste operator certification.

RELATES TO: KRS 224.01, 224.10, 224.40, 224.50

STATUTORY AUTHORITY: KRS 224.10-100, 224.40-100, 224.40-305, 224.40-605, 224.50-760

NECESSITY, FUNCTION, AND CONFORMITY: KRS Chapter 224 requires the cabinet to adopt administrative regulations for the management, processing, and disposal of special wastes. KRS 224.40-305 requires persons who establish, conduct, operate, maintain or permit the use of a waste site or facility to obtain a permit. This chapter establishes the permitting standards for special waste sites or facilities, and the standards applicable to all special waste sites or facilities. This administrative regulation establishes the program for education, testing, and certification of operators of special landfarming sites or facilities in accordance with KRS 224.40-605.

Section 1. Applicability. (1) The requirements of this administrative regulation apply to all special waste landfills, landfarms, and composting facilities operating under formal permits, as identified in 401 KAR 45:020, Section 2(1)(a) and (b).

(2) The owner or operator shall ensure that all technical operations at the special waste site or facility are conducted by or under the direction of an individual with a valid certification under this administrative regulation. The landfill, landfarming, or composting operator shall be reasonably available at the site or facility during operation.

(3) The certified operator shall ensure that all operations are conducted in compliance with this chapter.

(4) A special waste site or facility permit may be revoked or subject to other enforcement actions upon violation of the requirements of this administrative regulation.

Section 2. Transition of Certification. (1) Persons holding a valid certification for landfill manager, landfill operator, and landfarming operator under 401 KAR 47:070 shall be deemed to hold a valid certification under this chapter until the certification expires. At the time a certification expires, the certificate holder shall obtain special waste certification under this administrative regulation.

(2) Persons operating a special waste landfill who were not previously certified to operate a residual landfill under 401 KAR Chapter 47 shall obtain certification under this chapter within one (1) year of the effective date of this administrative regulation.

(3) Persons operating a special waste composting or landfarming site or facility shall obtain certification within one (1) year of the effective date of this administrative regulation.

Section 3. General Provisions for Landfills. (1) Each special waste landfill shall have a landfill operator certified in accordance with this administrative regulation.

(2) No special waste landfill shall operate in the absence of a certified operator without the appointment of an interim operator in accordance with Section 11 of this administrative regulation.

Section 4. General Provisions for Landfarming and Composting Facilities. (1) Each landfarming or composting facility shall have an operator certified in accordance with this administrative regulation.

(2) No landfarming or composting facility shall operate in the absence of a certified operator without the appointment of an interim operator in accordance with Section 11 of this administrative regulation.

Section 5. Application for Certification. (1) Persons desiring to be certified shall submit an application at least thirty (30) days prior to the scheduled training class. Applicants for training and examination shall use form DEP 6031 entitled "Application for Certification" (March 1992). The requirements contained in the application for certification are incorporated in this administrative regulation by reference. The application may be obtained from the Division of Waste Management, 14 Reilly Road, Frankfort, Kentucky 40601, (502) 564-6716, between the hours of 8 a.m. to 4:30 p.m., Eastern Time, Monday through Friday.

(2) The cabinet shall review applications and supporting documents, determine the eligibility of the applicant for examination, and notify the applicant of the determination.

(3) No person shall be eligible for examination for certification unless that person completes the appropriate training course provided by the cabinet, unless an alternative training program is accepted by the cabinet in accordance with Section 6 of this administrative regulation.

Section 6. Training Course Requirements. (1) The cabinet shall provide training courses for individuals desiring to become certified. All applicants for certification shall be required to attend a training course provided by the cabinet, unless alternate training is accepted under subsection (3) of this section.

(2) The training course shall address the technical and legal aspects of the facility type for which operator certification is sought.

(a) The training course for landfill operators shall include:

1. Permit application requirements for special waste landfills, including technical and administrative requirements;

2. Waste characterization;

3. Chemical and biologic reactions associated with the waste;

4. Hydrogeologic and engineering factors associated with the facility;

5. Operational requirements and achieving compliance with 401 KAR 30:031;

6. Duties and responsibilities associated with landfill management;

7. Requirements of this chapter as they apply to facility operation, including environmental monitoring, operations requirements, and maintaining compliance with 401 KAR 30:031;

8. Evaluating site suitability to receive wastes;

9. Environmental considerations in preventing violations of this chapter;

10. Maintaining equipment; and

11. Facility safety.

(b) The training course for landfarm and composting operators shall include:

1. Requirements of this chapter as they apply to facility operation and management;

2. Wastewater treatment processes;

3. Waste characterization;

4. Chemical and biological reactions associated with the waste;

5. Landfarming design and management;
6. Permit application requirements for special waste landfarms;
7. Environmental considerations in preventing violations of this chapter;
8. Achieving and maintaining compliance with 401 KAR 30:031;
9. Evaluating site suitability to receive waste;
10. Maintaining equipment;
11. Facility safety; and
12. Duties and responsibilities associated with operating a landfarm.

(3) The cabinet may accept alternate training courses, provided they result in a level of competence equivalent to that of participation in the cabinet's training course. It shall be the applicant's responsibility to submit documentation as the cabinet requires for an equivalency judgement of the alternate training course. This information shall contain at a minimum the following specifics: the course name; sponsoring agency; the date, location, and beginning and ending times of the course; a summary of the course content of sufficient detail to determine relevance and quality of the course; and a copy of the certificate received.

Section 7. Training and Examinations. (1) After training is complete, time shall be set aside for the purpose of examinations to determine the knowledge and ability of the applicant.

(2) Separate examinations shall be prepared to cover basic differences in the duties and responsibilities for the operation of each category of special waste site or facility.

(3) Applicants who fail to pass an examination may reapply for the examination at a regularly scheduled examination or by appointment with the cabinet. The cabinet shall require the applicant to attend the training session again if the applicant fails to pass the examination in three (3) attempts.

Section 8. Education and Equivalencies. (1) All applicants shall be evaluated by the cabinet as to education and experience as related to the appropriate category of special waste site or facility.

(2)(a) Applicants for landfill operator shall have completed high school, by graduation or by obtaining an equivalency certificate, and shall have a minimum of one (1) year of experience at a landfill facility.

(b) If an applicant for landfill operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfill or experience in a related field such as heavy equipment operator, road construction, surface mining.

(3)(a) Applicants for landfarming or composting operator shall have completed high school, by graduation or by obtaining an equivalency certificate, and shall have a minimum of one (1) year of experience at a landfarming or composting facility.

(b) If an applicant for landfarming or composting operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfarming facility or experience in a related field such as wastewater treatment or water treatment in determining eligibility for examination on a year-for-year basis.

Section 9. Issuance of a Certificate. (1) Certification may be issued to individuals upon meeting the minimum education requirements, work experience, and the course work requirements of this administrative regulation and passing the examination in accordance with Section 5 of this administrative regulation.

(2) Certification shall not be valid if obtained through fraud, deceit, or the submission of inaccurate data.

Section 10. Issuance of Certificate. (1) A certification shall be issued for a period of five (5) years, at the end of which the certification shall expire, unless renewed. Renewal procedures and requirements shall be the same as those for a new certification.

(2) The certification of an operator whose employment at a special waste site or facility terminates shall remain valid until expiration or revocation of certification.

(3) Certificates shall be carried on the person of the certified operator during working hours at the facility, or shall be prominently displayed at the facility office.

(4)(a) The cabinet may revoke the certification of an operator if the operator:

1. Has practiced fraud or deception;
2. Has failed to perform his duties under this chapter;
3. Has failed to use reasonable care and judgement in performance of his duties under this chapter; or
4. Has knowingly or willfully violated the requirements of this chapter.

(b) Individuals who have had their certification revoked shall be ineligible for future recertification.

Section 11. Interim Operators. (1) The permittee shall be responsible for actions of an interim operator. The permittee shall notify the cabinet in writing if the special waste site or facility will not have a certified operator for more than fourteen (14) consecutive operating days.

(2) Consecutive operating days, as used in subsection (1) of this section, shall be determined as any days:

(a) When the special waste site or facility accepts waste, operates equipment, or otherwise performs the business of special waste management; and

(b) That occur in sequence, regardless of whether nonoperating days such as weekends or holidays fall in between.

(3) The notification required by subsection (1) of this section shall be provided at least ten (10) days prior to an anticipated absence, and immediately upon discovery of an unanticipated absence. The notification shall contain:

(a) The name, address, and qualifications of the interim operator;

(b) The length of time for which the permittee seeks to have an interim operator rather than a certified operator; and

(c) Reasons for replacement of the certified operator with an interim operator.

(4) The cabinet shall evaluate the qualifications of the designated interim operator and shall notify the permittee of the cabinet's determination in writing within thirty (30) days of receipt of the permittee's notice. The determination shall:

(a) Approve, conditionally approve, or deny the permittee's request for designation of the interim operator;

(b) Identify the length of time an interim operator may operate the special waste site or facility; and

(c) Specify conditions as appropriate to the site and the interim operator's qualifications.

(5) An interim operator shall obtain certification under this administrative regulation within fifteen (15) months of becoming an interim operator.

(6) The cabinet may revoke the appointment of an interim operator in accordance with Section 10(4)(a) of this administrative regulation. Revocation shall render the person ineligible for operator certification under Section 10(4)(b) of this administrative regulation.

Section 12. Fees. (1) Fees for application for certification shall be:

- (a) \$125 for application for certification as a landfill operator;
- (b) \$125 for certification as a landfarming or composting operator;
- (c) Fifty (50) dollars for certification by reciprocity for all categories of operator; and
- (d) \$100 dollars for attendance at the certification training without taking the examination.

(2) Fees shall accompany applications and shall not be returned to those who do not qualify for a certificate. (18 Ky.R. 3094; Am. 3440; eff. 6-24-92.)

#### **401 KAR 47:070. Operator certification.**

RELATES TO: KRS 224.01, 224.10, 224.40, 224.43, 224.46, 224.70, 224.99

STATUTORY AUTHORITY: KRS 224.10-100, 224.40-605

NECESSITY, FUNCTION, AND CONFORMITY: KRS Chapter 224 requires the cabinet to adopt rules and administrative regulations for the management, processing or disposal of wastes. KRS 224.40-605 requires the cabinet to promulgate administrative regulations that establish standards and a certification program for operators of waste sites or facilities. This chapter establishes the permitting standards for solid waste sites or facilities, the standards applicable to all solid waste sites or facilities, and the standards for certification of operators. An overview of the permit program is found in Section 1 of 401 KAR 47:080. This administrative regulation establishes the program for education, testing, and certification of facility operators of solid waste sites or facilities.

Section 1. Definitions. The following are definitions as used in this administrative regulation:

(1) "Category of solid waste site or facility" means inert, residual, construction demolition debris, residential or contained landfill and includes landfarming facilities receiving Class I, II and III sludges or wastes.

(2) "Certificate" means a written document issued by the cabinet stating that the operator has met all requirements for certification.

(3) "Certified operator" means a solid waste site or facility operator who holds a valid certificate. The following are categories of certified operators:

(a) "Landfarming operator" means a certified operator who is the individual responsible for ensuring compliance with all permit conditions at a landfarming facility in accordance with 401 KAR 48:200, and who is reasonably available to the site;

(b) "Landfill operator" means a certified operator who is the individual responsible for the daily operating requirements identified in 401 KAR 47:120, 48:060, 48:090, or 48:170;

(c) "Landfill manager" means a certified operator who is the individual with primary responsibility for management and operation of the residential or contained or construction/demolition debris sanitary landfill to assure compliance with all permit conditions including direct responsibility for providing guidance to the landfill operator, or the permittee and the authority to commit financial resources allocated for proper operation; or

(d) "Interim operator" means the individual identified by the permittee as the replacement landfarming operator, landfill operator, or landfill manager in accordance with Section 12 of this administrative regulation.

Section 2. Applicability. (1) The requirements in this administrative regulation apply to all solid waste sites or facilities except as subsection (2) of this section provides otherwise. Each solid waste site or facility shall have at least one (1) operator certified in accordance with Section 3 (sanitary landfills) or Section 4 (landfarming facilities) of this administrative regulation, as appropriate to the category of solid waste site or facility.

(2) Residual landfills and facilities operating under a registered permit-by-rule or a permit-by-rule are excluded from the requirements of this administrative regulation, unless the cabinet requires operator certification as a condition of the permit. In deciding whether to require operator certification at a residual landfill, a site or facility with a registered permit-by-rule or a permit-by-rule, the cabinet shall consider:

- (a) The characteristics of the waste stream;
- (b) The characteristics of the site, including geology and hydrology; and
- (c) The experience and qualifications of the operator.

(3) It shall be the responsibility of the permittee to ensure that the solid waste site or facility complies with the requirements of this administrative regulation.

Section 3. General Provisions for Landfills. (1) Each construction/demolition debris, residential and contained landfill shall have a certified operator who is a landfill operator and a landfill manager. The requirements of this subsection may be fulfilled by:

(a) One (1) individual who has been certified in accordance with Section 6 of this administrative regulation for both categories of certified operator (provided this individual meets the qualifications in Sections 1(3) and 11 of this administrative regulation); or

(b) Two (2) individuals who have been certified in accordance with Section 6 of this administrative regulation in each category of operator such that one (1) individual is certified as a landfill operator and one (1) individual is certified as a landfill manager.

(2) As provided in Section 2 of this administrative regulation, the cabinet may require as a permit condition that a residual landfill or a site or facility with a permit-by-rule or registered permit-by-rule shall have a certified operator who is a landfill operator or a landfill manager or both. The permit condition imposed shall reference all applicable operating administrative regulations and requirements for the specific category of sanitary landfill.

(3) In the event the certified operator who is the landfill operator is not physically at the facility during operating hours, either the landfill manager or an interim operator shall be designated responsible for daily site operation and shall be physically located on site. If an interim operator assumes responsibility for daily operation of the landfill, the requirements in Section 12 of this administrative regulation shall be met.

(4) In carrying out its responsibilities, the cabinet shall examine the qualifications of applicants for certification and maintain records of certification and a register of certified operators.

(5)(a) Except as provided in Section 2 of this administrative regulation, no landfill shall continue operation in the absence of a landfill operator on site for more than ten (10) consecutive operating days without appointment of a qualified interim operator in accordance

with Section 12 of this administrative regulation or written approval from the cabinet.

(b) Except as provided in Section 2 of this administrative regulation, no landfill shall continue operation in the absence of a landfill manager for a period longer than thirty (30) consecutive operating days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

Section 4. General Provisions for Landfarming Facilities. (1) Each landfarming facility shall have a landfarming operator certified in accordance with Section 6 of this administrative regulation.

(2) No landfarming facility shall continue operation in the absence of a landfarming operator for a period longer than five (5) consecutive working days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

Section 5. Application for Certification. (1) An individual desiring to be certified shall file an application on a form provided by the cabinet at least thirty (30) days before beginning training for a scheduled examination.

(2) The applicant shall submit all information needed to determine eligibility of the applicant for examination and certification.

(3) The cabinet shall review applications and supporting documents, determine the eligibility of the applicant for examination and notify the applicant of the determination.

(4) No person shall be eligible for examination for certification unless that person completes the appropriate training class or classes provided by the cabinet, unless an alternative training program or certification program is accepted by the cabinet in accordance with Section 7(6) of this administrative regulation.

Section 6. Training Classes and Examinations. (1) The cabinet will provide training classes for the certified operator.

(2) Training sessions will be held at least annually at places and times set by the cabinet. The last day of each training session will be set aside for the purpose of examinations to determine the knowledge and ability of the applicant.

(3) Certification shall be conditioned on successful passage of a written examination, unless an alternative examination process is accepted by the cabinet.

(4) Separate examinations will be prepared to cover basic differences in the duties and responsibilities for the operation of each category of solid waste site or facility and each category of certified operator.

(5) Applicants who fail to pass an examination may reapply for the examination at a regularly scheduled examination or by appointment with the cabinet. The cabinet shall require the applicant to attend the training session again if the applicant fails to pass the examination in three (3) attempts.

(6) In the event an applicant fails to meet the requirements for certification, he may petition the cabinet for a one (1) time only "temporary hardship certification." The cabinet will then conduct an informal hearing at which evidence shall be presented by the applicant to support his hardship request. Each temporary hardship certification request shall be considered on a case-by-case basis under the following guidelines:

(a) Failure of the applicant to receive certification would leave a significant area of the state without adequate waste disposal service.

(b) The applicant has shown a good faith effort by attending all required training sessions and met all requirements except the applicant has failed in three (3) attempts to pass the examination.

(c) The applicant has shown, through cabinet inspections, a capability for satisfactory operation of the solid waste site or facility.

Section 7. Training Course Requirements. (1) All applicants for certification shall be required to attend a training course provided by the cabinet in accordance with KRS 224.844.

(2) The training course provided by the cabinet shall be designed to provide information as appropriate to the category of certified operator. At a minimum, the training course shall provide information which enables the certified operator to perform his duties in a knowledgeable and competent manner.

(3) Landfill managers shall be trained on:

(a) The requirements for permit application for the applicable category of sanitary landfill including ownership, zoning, chapter 109 district boards, geologic and hydrologic information and specific design details;

(b) Characteristics of the waste stream; the physical, chemical and biological reactions including the hydrogeologic interactions of a landfill; and measures that shall be employed to meet the environmental performance standards in 401 KAR 47:030 and all other regulatory requirements; and

(c) Specific duties expected to be performed by individuals who are wholly responsible for the requirements associated with the operation of the applicable category of sanitary landfill permitted by the cabinet. These actions include at a minimum, the commitment of resources, oversight of operating personnel, and verification that site operation is in accordance with all provisions of the permit including technical documents.

(4) Landfill operators shall be trained on the requirements contained in the solid waste administrative regulations as they apply to daily site operation duties. These duties include judging indicators regarding a site's ability to receive wastes; judging waste characteristics for disposal acceptability; employing site equipment to maintain waste compaction, cover, and surface water management on a daily basis; maintaining equipment; maintaining site safety; and generally assuring compliance with the administrative regulations.

(5) Landfarming operators shall be trained on the Kentucky waste management program as it applies to landfarming; wastewater treatment processes; the nature and characteristics of sludges; the physical and chemical properties of sludges; landfarming design and management; environmental considerations; and the Kentucky waste management permit process. The permit process includes requirements for application, conditions for maintaining a permit in compliance with the application and administrative regulations, and amendments to the landfarming activity and associated permit.

(6) The cabinet shall provide the training course to applicants for certification. However, the cabinet may consider alternate training courses or certification programs provided they are equivalent to the content prescribed by the cabinet's training course. It shall be the applicant's responsibility to submit such documentation as the cabinet requires for an equivalency judgment of the alternate training course. This information shall contain at a minimum the following specifics: the course name; sponsoring agency; the date, location and the beginning and ending times of the course; a summary of the course content of sufficient detail to determine relevance and quality of the course; and a copy of the certificate received.

Section 8. Issuance of Certificates. (1) Upon passage of the examination the cabinet will issue a certificate to the applicant which will indicate the category of solid waste site or facility and the category of certified operator for which the operator is certified.

(2) Certified operators shall be recertified every five (5) years.

(3) Certificates will be issued to holders of certificates of another state if the training requirements of the issuing state are deemed comparable as specified in Section 7(6) of this administrative regulation and if the operator passes the cabinet's examination.

(4) The certificates of operators who terminate their employment at a solid waste site or facility will remain valid until expiration or revocation of the certificate.

(5) Certificates shall be carried on the person of each certified operator during working hours at the facility or prominently displayed on site.

Section 9. Compliance Dates. (1) An operator who is not an appropriately certified operator and who assumes the responsibility of a certified operator shall immediately comply with the requirements in Section 12 of this administrative regulation; and

(2) Comply with the requirements in Section 6 of this administrative regulation within fifteen (15) months of assuming the responsibility.

Section 10. Revocation of Certificate. (1) The cabinet may revoke the certificate of an operator, following a cabinet hearing, when it determines that the operator has practiced fraud or deception, or that the operator has failed to perform an operator's duties including, but not limited to, failure to comply with permit conditions.

(2) The cabinet may revoke a certificate whenever the holder fails to use reasonable care and judgment in the performance of an operator's duties. No certificate shall be valid if obtained through fraud, deceit, or the submission of inaccurate data on qualifications.

(3) Individuals who have had their certificate revoked by the cabinet shall be ineligible for future recertification.

Section 11. Operator Qualifications: Education and Equivalencies. (1) All applicants shall be evaluated by the cabinet as to education, and experience as related to the appropriate category of solid waste site or facility.

(2)(a) Applicants for landfill operator shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have a minimum of one (1) year of experience at a landfill similar to the category of landfill for which certification is sought.

(b) If an applicant for landfill operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfill or experience in a related field (i.e., heavy equipment operator, road construction, surface mining, etc.) in determining eligibility for examination on a year-for-year basis.

(3)(a) Applicants for landfill manager shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have:

1. A minimum of two (2) years administrative experience in a related field (i.e., waste management, wastewater treatment, etc.); or

2. A minimum of two (2) years of postsecondary education; or

3. A minimum of two (2) years of a combination of experience in a related field and postsecondary education.

(b) If an applicant for landfill manager does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the qualifications of the applicant on a case-by-case basis.

(4)(a) Applicants for landfarming operator shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have a minimum of one (1) year of experience at a landfarming facility.

(b) If an applicant for landfarming operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfarming facility or experience in a related field (i.e., waste water treatment, water treatment, etc.) in determining eligibility for examination on a year for year basis.

Section 12. Interim Operators. (1) In accordance with the requirements in subsection (2) of this section, the permittee shall notify the cabinet in writing of the extended absence of a certified operator ten (10) days prior to an anticipated absence and immediately upon discovery of an extended absence due to an emergency or unanticipated circumstances. The notice from the permittee shall provide the cabinet with the following information:

(a) Name and qualifications of the individual intended to replace the certified operator; and

(b) The length of time for which the permittee seeks to have the interim operator fulfill the obligations of the certified operator.

(2) The permittee shall notify the cabinet of the extended absence when the operator or manager shall be absent for:

(a) More than ten (10) consecutive operating days for a landfill operator;

(b) More than thirty (30) consecutive operating days for a landfill manager; and

(c) More than five (5) consecutive operating days for a landfarming operator.

(3) Consecutive operating days as used in subsection (2) of this section shall be determined as any days:

(a) When the solid waste site or facility accepts waste, operates equipment or otherwise performs the business of solid waste management; and

(b) Which days occur in sequence regardless of whether nonoperating days such as weekends or holidays fall in between.

(4) The cabinet shall evaluate the qualifications of the designated interim operator and shall notify the permittee of the cabinet's determination in writing within thirty (30) days of receipt of the permittee's notice. The determination shall:

(a) Approve or deny the permittee's request for designation of the interim operator;

(b) Identify the length of time the interim operator may operate the solid waste site or facility; and

(c) Specify conditions as appropriate to the site and the interim operator's qualifications.

Section 13. Permit Condition. As specified in Section 2 of this administrative regulation, every solid waste site or facility requiring a permit shall be operated by the operator certified pursuant to this administrative regulation. Pursuant to Sections 2 and 3 of this administrative regulation, maintaining the certified operator(s) shall be considered a permit condition, and the permit may be revoked, or penalties for permit violations sought as appropriate, upon violation of the requirements and duties established by this administrative regulation.

Section 14. Fees. (1) Fees for application for certification shall be:

- (a) \$125 for application for certification as a landfill operator;
- (b) \$125 for application for certification as a landfill manager;
- (c) \$150 for application for certification as both a landfill operator and a landfill manager when the application is made for certification for both categories at the same training session;
- (d) \$125 for application for certification as a landfarming operator; and
- (e) Fifty (50) dollars for certification by reciprocity for all categories of operator.

(2) Fees shall accompany applications and will not be returned to those who do not qualify for a certificate. (Recodified from 401 KAR 2:111, 3-1-83; Am. 10 Ky.R. 172; eff. 12-2-83; 13 Ky.R. 913; 1228; eff. 1-13-87; 16 Ky.R. 1642; 2174; eff. 5-8-90.)

